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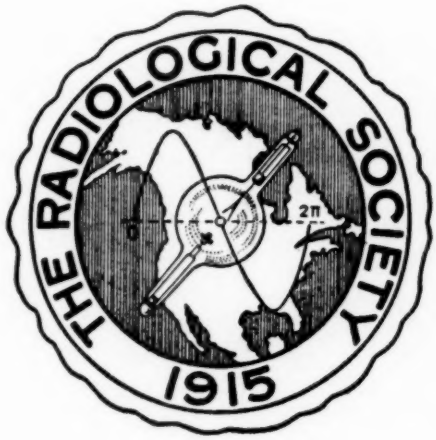

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The Physical Foundations of Deep Therapy*

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Frankfort, Germany

THIS paper deals with the methods of deep therapy which have been developed by Professor Dessauer in his institution for the physical foundation of medicine in the Frankfort University.

Seventeen years ago, Dessauer investigated the physical and technical side of the problems of deep therapy. The problem was this: Is it possible to produce the same effect in the deeper parts of the human body in a similar manner as that on the surface of the skin? The solution to this question soon led to the formation of Dessauer's law of homogeneous radiation, which includes both a qualitative and quantitative homogeneity. By qualitative homogeneity, Dessauer means a mixture of rays, consisting of wave components which do not materially change when penetrating into the deeper parts. The idea which called forth the qualitative homogeneity is the following: It is not known, whether the same amount of absorbed soft or hard rays have the same or different biologic effect on tissue. Not only is it necessary to apply the same kind or quality of rays, but also the same amount or quantity, if we wish to study their biologic effects on healthy and diseased cells. In order to produce a quantitative homogeneity, that is, an absorption of the same amount of rays in different depths of tissue, very high penetrative rays are required. At the time of Dessaur's first research, it was not possible to produce sufficiently penetrating rays, as apparatus was not constructed which would deliver continuously the high voltages. Dessauer's technical research work led to the construction of apparatus which will deliver the required voltages of two to three hundred thousand and above. The development of the Coolidge tube has given us tubes which will stand very high voltages. They also possess the further advantage of constantly producing the required rays, which may be varied at will in their quality as well as quantity. With the advent of the apparatus and tubes the means had been obtained for the development of an efficient deep therapy.

The biologic studies had at this time shown that diseased and healthy tissues react differently to the rays. Wefferer was the first to study the question of "sensibility," Kroenig, Friedrich, Bumm, and Warnekros, Serts and Wintz, have made many biological and physical investigations. Thereby, the intensities or energies of radiation were determined that were necessary for the production of a therapeutic effect in the deep parts of the body. The question of the distribution of the intensity of the rays within the interior of the human body was not solved. Dessauer was the first to point out that when raying with homogeneous radiations, the problem could be very much simplified by estimating not the absorbed, but the transmitted energy for the study of the biologic effect. When determining the transmitted energy, the physical laws of absorption and scattered radiation, as well as many other facts must be considered.

Among these factors may be mentioned the size of the field. Using a large field, an additional amount of energy is produced through scattered radiation. The energy is not only greater in the area within the ray beam, but also in the parts adjacent to it.

The distribution of the intensity within the body was studied by Dessauer and his co-workers. As water has the same qualities of absorption as human tissue, the experiments were made in a water phantom. By photographic methods, accurate values for the distribution of the radiation were obtained. The investigations were made for three variable factors, namely, focus-skin distances of thirty, forty, fifty, sixty and seventy centimeters; fields from six by eight centimeters to the largest practicable, and voltages measured at the tube terminals of one hundred and fifty, one hundred and sixty, one hundred and eighty, and two hundred kilovolts crest value, filtered through 0.5 to 1.3 millimeters copper and one millimeter aluminum, the choice of the thickness of the filter depending on the voltage.

The quality of the radiation can be stated more exactly by the total absorption factor W, which may be very accurately ascertained by means of an electroscope and known absorption filters. The total absorption factor W for water, used in these experiments was 0.14 to 0.18. With the three variable factors given—distance, size and field and quality of ray, the distribution of the rays in the radiated medium was studied. The results were published in a number of articles and collected in a number of tables and charts ready for use. A copy of this work will soon be published in English by Rebman and Company in New York.

I will now show you some of the charts. The intensity on the surface of the skin is assumed to be one hundred per cent, and those within the deeper parts of the body are expressed in percentage of the surface intensity. The curves connect all points having the same intensity and show the distribution of intensities within the body. Fig. 1.

The curves reveal unexpected results. For instance, parts which are protected from the direct rays receive quite a large amount of radiation through scattering from the radiated one. Within four to five centimeters beyond the periphery of the radiation beam, half the intensity is still active. If the experimental measures are compared with the values calculated from the laws of absorption, these intensities are almost six times as large as the calculated values obtained within the interior of the body, if large fields and very penetrating rays are used. The effect of the scattered radiation is more marked in the deeper parts, whereas the first few centimeters receive only a small amount of scattered rays. (Fig. 2, Fig. 3, and Fig. 4.)

With these charts the specialist is enabled to formulate an exact plan for treatment. Let us consider as an example a carcinoma of the cervix of the

*—Read at the Annual Meeting of The Radiological Society of North America, Chicago, Dec. 9, 1921.

uterus, with an invasion of the parametria and metastases in the lymph glands along the bony pelvic walls. The medical man will ask the scientist to produce within a certain zone at a certain point, a known intensity of rays. According to the facts given by Friedrich, Kroenig, Sertz and Wintz, the location of the carcinoma must receive about the same intensity which would produce upon the skin an erythema dose, placed arbitrarily at a value of one hundred. In our case a rather extended zone must receive this intensity, for it would be absolutely insufficient if only a part of the carcinoma were to receive the full energy. In a case that we have studied in 1920, the whole zone from the tuberosity of the ischium to the navel had to be radiated uniformly. Fig. 5 and Fig. 6.

How may such a problem be satisfactorily solved? With a single field it is not possible, to produce a uniform trans-radiation with a hundred point energy in the deeper parts and one must try to radiate the particular zone from several entrances. Generally, four fields are found sufficient, the frontal, dorsal and two lateral. The frontal and dorsal fields may be very large, up to eighteen by twenty-four centimeters. The lateral fields must be smaller, corresponding to the smaller surfaces of the lateral aspects of the pelvis. To ascertain what intensities will be furnished through each of the four fields, we must make a cross-section of the body in line with the center of the disease or of the zone to be radiated. This cross-section is drawn in natural size upon tracing paper. The latter is placed upon the charts in such a manner that the surface is in line with the line one hundred, and so that the central ray passes through the center of the carcinoma. A few points should be marked on the cross-section in order to ascertain the energy obtained at these points in the interior. Thus, we can calculate whether the carcinoma is receiving sufficient homogeneous intensity throughout or not. It is also necessary to determine the intensities which the skin and healthy tissues receive. A table may now be prepared in which the horizontal row carries the values at the points marked, and the vertical row the volume at the point of entrance. Such a scheme is shown in Fig. 7. The summation of the values in the columns gives the total at the given points obtained through each field. It can be seen that the intensity of the radiation which has passed through the body must be known, as it might amount to a value higher than permissible. In this instance it is fifty per cent too high. To eliminate all danger of a burn, the time of radiation in this case must be reduced by one-third. Thereby, the intensities are changed, as enumerated in the last column. The method demonstrates the advantage of large sized fields and the possibility of reducing the time-duration of the application of the rays to the lowest permissible amount. Should certain points on the surface or in the interior receive too large or too small an intensity, a shortening or an increase of the time-duration of the application in a certain field may reduce the danger.

It is not always easy to find the proper method of distribution if the patient is very fat or very lean. The diseased zone may be very deep in the first, or the skin surface may be too small in the last instance. The question arises, how under such circumstances, a greater effect in the deeper parts may be produced? There are different ways which are illustrated in the following cross-section. (Fig. 8.) You will see that the first method would not lead to the desired result and that the intensity of one hundred on the surface decreases towards the center and again increases to ninety-five per cent towards the end. If a higher voltage is chosen, it is possible to gain a very much better intensity in the interior, as you will see from the next figure, Fig. 9. The latest deep therapy apparatus and tubes permit the production of a still better ray and make it possible to obtain a still larger quantity of rays on the interior, or, in other words, offer a very much larger protection of the skin.

A similar gain of intensity in the deeper parts can be gained by increasing the focus-skin-distance and a corresponding increase in the time of exposure. The result of such a method is shown in the next figure, Fig. 10.

Another method to raise the effect in the deeper parts is the employment of a superposed material which possesses the same qualities of absorption and scattering as living tissue. Such materials are wax, paraffin or bags filled with water. By their use the drop of intensity towards the interior is retarded and the improvement of the dose in the deeper parts is increased, as is shown in the drawing, Fig. 11.

Finally, the application of radium might be advantageously employed to increase the amount of radiation in the cancer organ and thus supply the deficiency in the roentgen radiation, as shown in Fig. 12 and Fig. 13.

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The solution of the problem of treatment is different when the carcinoma is near the surface, when it can only be attacked from one side and therefore can not be homogeneously radiated. In such a case, for instance, a carcinoma on the tongue, or of the oesophagus, the conditions for treatment are very unfavorable. The medical man may ask, what is to be done under these circumstances? The scientist answers: "Produce for these parts similar topographical conditions as are found in a uterine cancer. For this purpose, layers of the above mentioned materials, wax, for instance, should surround the jaws and neck. In the case of carcinoma of the tongue, the mouth may be filled with paste, as the air contained in the cavities of the mouth has different values of absorption than tissue.

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Finally, I wish to state that it is possible by physical methods to ascertain in advance the quality of rays furnished by any apparatus, and also the time required to produce an erythema skin dose with such a ray and the penetration attained.

For calibrating transformers and tubes I have built a small portable standardized electroscope with which I can find the intensity of the rays, their quality and homogeneity, the time duration to obtain the erythema skin dose, the penetrability of the ray and the proper filtration.

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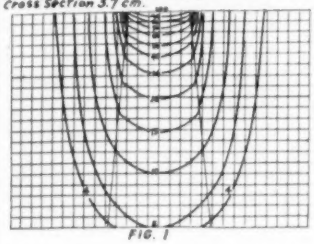

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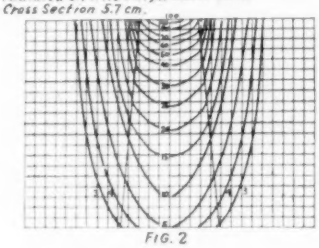


FIG. 2

Distribution of Intensity under conditions as follows: Coolidge tube with tungsten or platinum anode. Voltage on tube approximately 150 K.V. Filtration 0.5 Cu. plus 1 Al. Focus-Skin distance 30 cm. Fields radiated 18 x 24 cm. M Water 0.180 Cross Section 18 cm.

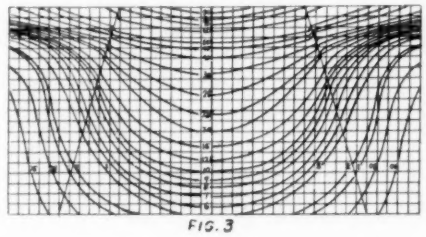


FIG. 3

Distribution of Intensity under Conditions as follows: Coolidge tube with tungsten or platinum anode. Voltage on tube 162.5 K.V. Filtration 0.5 Cu. plus 1 Al. Focus-Skin-distance 30 cm., Fields radiated 18 x 24 cm. M Water 0.166 Cross Section 18 cm.

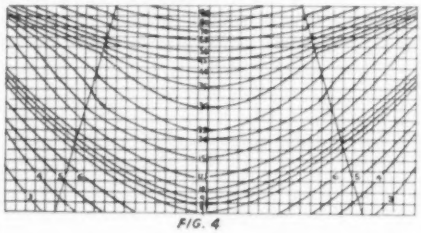


FIG. 4

Cross Section in 10 cm. depth thru large pyramid. Voltage on tube approximately 200 K.V. Filtration 1.3 Cu. Plus 1 Al. Focus-skin distance 30 cm. Field radiated 18 x 24 cm. M water 0.140

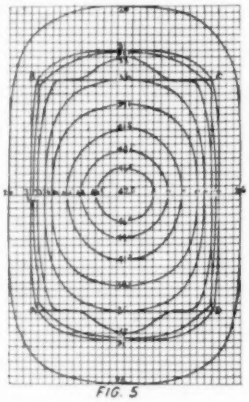
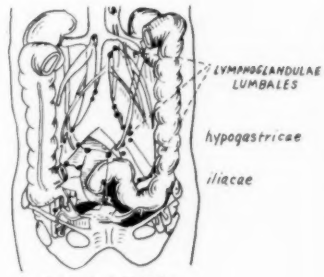


FIG. 5



Anatomical Field for Uterus Carcinoma Treatment

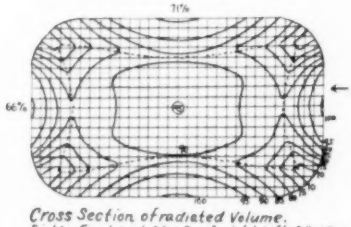
FIG. 6

Radialim Table for Uterus Carcinoma.

Fields	Points A	B	1	2	3
Front	100	30	48	75	40
back	22	30	48	33	41
right	18	4	27	24	9
left	18	100	27	24	53
Total	158	164	150	156	143
% Erythem	106	109	100	104	95

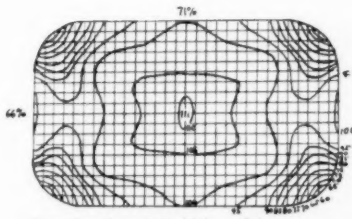
← FIG. 7

2 fields 24 x 18 cm. Frontal-back
2 fields 24 x 9 cm. Right-left
Focus-tube distance 30 cm. M water 0.149



← FIG. 8

Cross Section of radiated Volume.
Fields, Front, back 24 x 18 cm², right, left, 24 x 9 cm²
Focus-skin distance 30 cm.
Absorption coefficient 0.149



← FIG. 9

Cross Section of Radiated Volume
Fields: Front-back 24 x 18 cm.², Right-left 24 x 9 cm.²
Focus-Skin distance 30 cm.
Absorption Coefficient 0.140

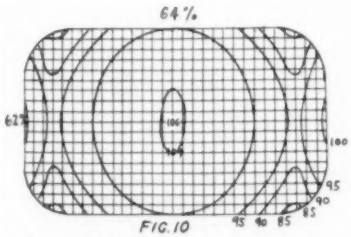


FIG. 10

Cross section of Radiated Volume.
Fields: front, back 20.1 x 26.8 cm². right, left 10 x 26.8 cm.²
Focus-skin distance 50 cm.
Absorption Coefficient 0.149

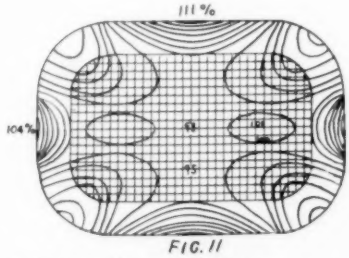


FIG. 11

Radiation with 4 cm. Paraffin layer.
Fields: front-back 24 x 18 cm.² right-left 24 x 9 cm.²
Focus-paraffin-distance 30 cm.
Absorption Coefficient 0.149

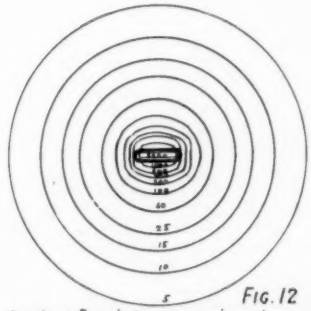
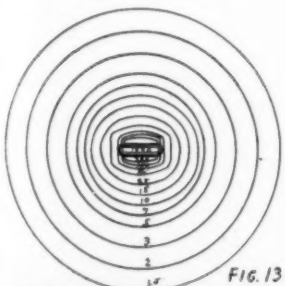


FIG. 12

Erythena Dose in 3 cm. space in water or tissue produced by 5000 Mg-Ra-El. hrs. All figures are reduced to 100 = Erythema dose or 5000 Mg-Ra-El. hrs.



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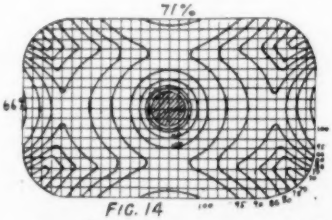

FIG. 14

Combined Roentgen-ray-radium treatment.
Fields: Front back 24 x 18 cm², right, left 24 x 9 cm.²
Focus-skin distance 30 cm.
Absorption coefficient 0.149 Mg-Ra-El-St. 1000

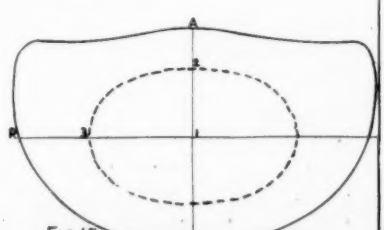

FIG. 15

Cross-Section thru Abdomen

uterus, with an invasion of the parametria and metastases in the lymph glands along the bony pelvic walls. The medical man will ask the scientist to produce within a certain zone at a certain point, a known intensity of rays. According to the facts given by Friedrich, Kroenig, Sertz and Wintz, the location of the carcinoma must receive about the same intensity which would produce upon the skin an erythema dose, placed arbitrarily at a value of one hundred. In our case a rather extended zone must receive this intensity, for it would be absolutely insufficient if only a part of the carcinoma were to receive the full energy. In a case that we have studied in 1920, the whole zone from the tuberosity of the ischium to the navel had to be radiated uniformly. Fig. 5 and Fig. 6.

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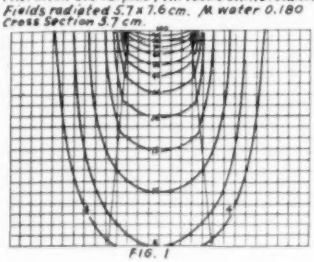

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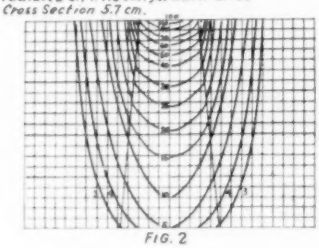

FIG. 2

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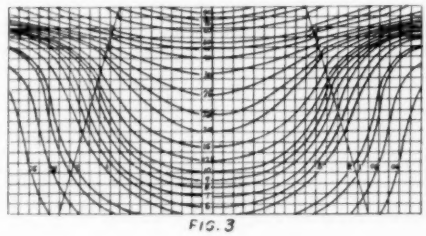


FIG. 3

Distribution of Intensity under Conditions as follows: Coolidge tube with tungsten or platinum anode. Voltage on tube 162.5 K.V. Filtration 0.5 Cu. plus 1 Al. Focus-Skin-distance 30 cm. Fields radiated 18 x 24 cm. M Water 0.166 Cross section 18 cm.

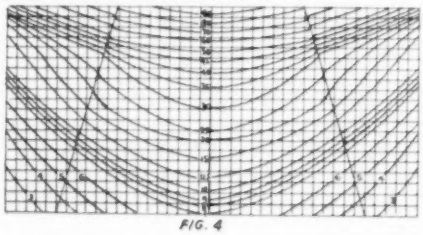


FIG. 4

Cross Section in 10 cm. depth thru large pyramid. Voltage on tube approximately 200 K.V. Filtration 1.3 Cu. Plus 1 Al. Focus-skin distance 30 cm. Field radiated 18 x 24 cm. M water 0.140

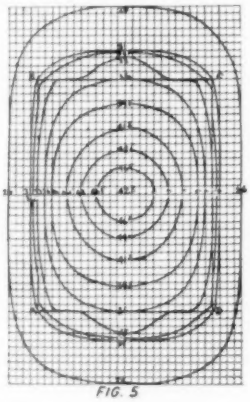
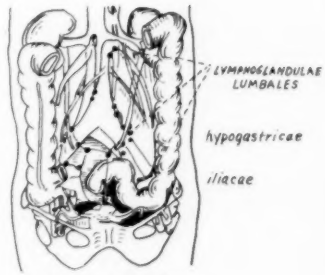


FIG. 5



Anatomical Field for Uterus Carcinoma Treatment

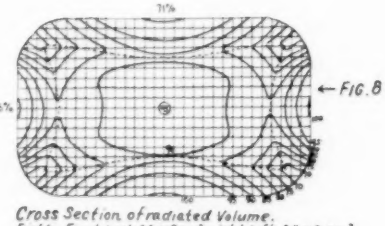
FIG. 6

Radiation Table for Uterus Carcinoma.

Fields	Points A	B	1	2	3
Front	100	30	48	75	40
back	22	30	48	33	41
right	18	4	27	24	9
left	18	100	87	24	53
Total	158	164	150	156	143
% Erythem	106	109	100	104	95

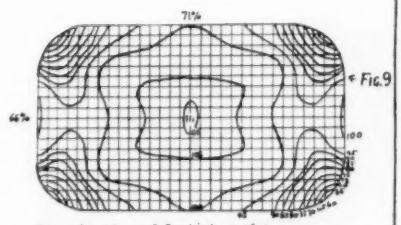
← FIG. 7

2 fields 24 x 18 cm. frontal-back
2 fields 24 x 9 cm. Right-left
Focus-tube distance 30 cm. M water 0.149



← FIG. 8

Cross Section of radiated Volume.
Fields, Front, back 24 x 18 cm², right, left, 24 x 9 cm².
Focus-skin distance 30 cm.
Absorption coefficient 0.149



← FIG. 9

Cross Section of Radiated Volume
Fields: Front-back 24 x 18 cm², Right-left 24 x 9 cm².
Focus-Skin distance 30 cm.
Absorption Coefficient 0.140

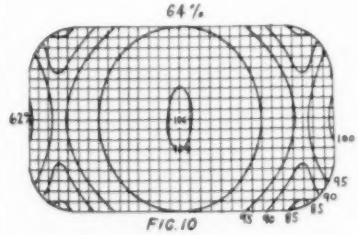


FIG. 10

Cross section of Radiated Volume.
Fields: front, back 20.1 x 26.8 cm². right, left 10 x 26.8 cm.²
Focus-skin distance 50 cm.
Absorption Coefficient 0.149

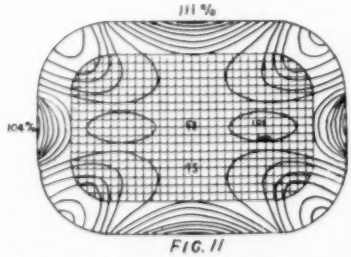


FIG. 11

Radiation with 4 cm. Paraffin layer.
Fields: front-back 24 x 18 cm², right-left 24 x 9 cm².
Focus-paraffin-distance 30 cm.
Absorption Coefficient 0.149

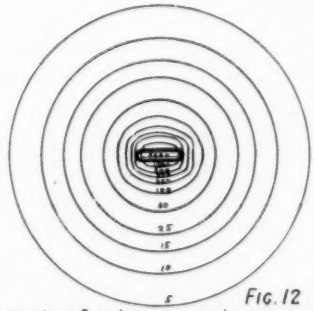


FIG. 12

Erythema Dose in 3 cm. space in water or tissue produced by 5000 Mg-Ra-El. hrs. All figures are reduced to 100 = Erythema dose or 5000 Mg-Ra-El. hrs.

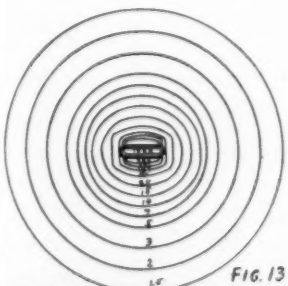


FIG. 13

Erythema Dose in 3 cm. space in water or tissue produced by 5000 Mg-Ra-El hrs. All figures are reduced to 100 = Erythema Dose or 1000 Mg-Ra-El hrs.

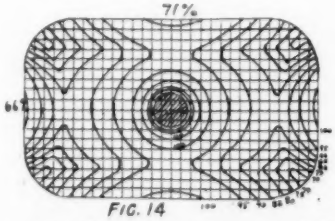


FIG. 14

Combined Roentgen-ray-radium treatment.
Fields: Front, back 24 x 18 cm², right, left 24 x 9 cm.²
Focus-skin distance 30 cm.
Absorption coefficient 0.149 Mg-Ra-El-3t. 1000

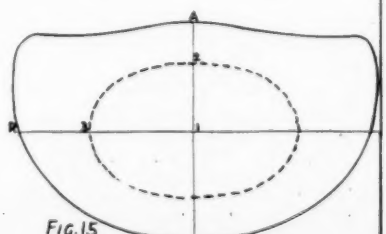


FIG. 15

Cross-Section thru Abdomen.

with this method. It enables one to select the proper radiation and determine the actual intensity obtained in the deeper parts. The multiple, small field method of x-ray therapy must be replaced by the large field method to prevent the loss of the therapeutically important scattered radiation which is totally sacrificed in the old method. When you employ the new methods, work with extreme care and accuracy and you will attain still better results than in the past.

DISCUSSION

DR. HENRY SCHMITZ *(Chicago)*: I did not expect to discuss the paper. The one point that Professor Dessauer brings out is the fact of the homogeneity of the radiation. It must be qualitative as well as quantitative. In other words, the ray which strikes the surface of the body should be the same kind of ray that enters and passes through the body. It must be of the same quantity on the surface as it should be in the interior. This result can be obtained only by choosing the proper focal skin distance, the proper voltation and the proper size of field and filter for that voltation, the number of fields and sizes of fields which will bring into the interior of the body radiation which may degenerate the carcinoma.

The set of charts worked out by Professor Dessauer, based on these factors, gives us equal intensity curves at various percentages, starting with one hundred at the skin and going to ninety, eighty, seventy, sixty, etc. We know it because a certain intensity takes within the body. Within the radiation field there seems to be a variation in the depth. In other words, within the center, or four or five centimeters from the center, the radiation seems to be horizontal. As it reaches the periphery, it seems to rise. The radiation is strongest in the center and decreases slowly as the periphery of the radiation shows.

In the large radiation of twenty centimeters there is a difference at times of thirty per cent of the center of the radiation field. If we were treating carcinoma that had a transverse diameter of twenty centimeters, then we would probably obtain intensity of one hundred in the center. At the periphery the intensity would be only seventy per cent at the same height. It will not do any harm, as far as the patient is concerned. The intensity of seventy will not cause the carcinoma to disappear rapidly.

In the radiation field, that is, in the adjacent parts of the tissue, there is still a scattered radiation. This is quite large,as we were told by Dr. Bachem. That is very important in therapy. Intensity in a certain instance might be from twenty to twenty-five per cent. If we add radiation from a lateral field to this radiation, we must get this twenty-five per cent in order not to use an intensity which might cause harm to the tissues.

I am sure you have all found cases of an erythema skin dose given through multiple fields and you wondered why necrosis beneath the skin occurred. There was an overlapping between the radiation beams in the interior of the body.

It also shows another thing and that is the importance of correct work in deep radiation therapy. In the first place, the selection of the proper variable factors. It makes a lot of difference whether you have a focal skin distance of thirty centimeters or one of fifty or sixty-five. It makes a great deal of difference whether you use a small field or a large field. It makes a difference whether you use a filter adopted for that kind of voltage. If it is too weak, you get a different intensity of quality of radiation. If it is too thick a filter, you are working very economically because a good deal of radiation is lost which would be of benefit to your patient if you were using proper filter.

Dr. Bachem has invented an electroscope. With this he is enabled to determine intensity of the radiation without reference to the kilovoltage which might be used in that machine. You can determine the proper filter to be used in that kind of radiation.

In the third place, the penetration of the radiation, and fourth, the time duration of the application. If this instrument actually does what Dr. Bachem claims for it, and I have no reason to doubt it, it would be a great advance in our armamentarium for deep roentgen therapy. I believe I have talked long enough. Thank you. (Applause.)

DR. PARISEAU: Mr. President, if you will allow me, I will try to condense all that I have gathered from talking in every corner with everybody. The impression I have gathered from all of this talk is that there is a certain amount of pessimism. People are all up in the air as to the value of the method, whether it is a step forward, whether we are able to standardize, etc. I should say that the general impression is dismal. I think we must not leave with that impression.

I must reiterate that everything that has been done in deep therapy is a distinct step forward. The contribution of our German colleagues is a step forward. We know more what we are doing than what we did.

I said in my paper that there were ample physical reasons justifying the use of higher voltages. It seems that these drafts show it. There is no reason to believe that one kind of ray, one wave length, is better for cancer than another. That is not proved. There are physical reasons for knowing when we have jumped from a ten inch spark to a fifteen or twenty. We are working under better conditions. We can do it with a ten inch spark the same, but as stressed by these drafts, we can do it with considerable more danger to the skin. Therefore, that part is certainly a distinct step forward.

The drafts are absolutely exact. I have no reason for doubting they are right, but I cannot be tempted to borrow them for my own use. The other drafts have to be made for other machines or conditions. I will try to explain why with a very short sketch.

We will take two widely different cases of a man who is working with a coil and a man who is working with a transformer. In one case his voltage curve may be of this type, eliminating the inverse. In the other case it may be a curve of that type, because they have the same peak. Our tendency is to conclude they will let through exactly the same kind of rays. Of course, you know that this part of the sign curve will let through rays that are rather too long, but I could filter them out. Because you know you could filter them out, you may be inclined to think you have the same peak, duplicated, the same quality of waves. You have not.

Professor Duane has shown us in a most conclusive manner that there is no comparison possible for equal voltages between the quality of rays—the bunch delivered by transformer and the bunch delivered with his sustained voltage apparatus—that is, smoothing out the pulsations with condensers. Why? How are these rays produced? A certain number of electrons are torn off of the cathode as it is bombarded. The wave length will be proportional to the speed of these electrons and the speed of the electrons is proportionate to the voltage impressed through the tube. If we have a sustained high voltage, we are shooting out electrons continually at the same speed. They keep on running to the target, throwing out wave lengths that are more homogeneous.

If we shoot out voltage that reaches the same peak but sign voltage, the lower part will throw out sluggish electrons. They will start towards the cathode. Immediately after electrons with greater speed are supposed to be thrown towards the cathode. Do you think they will reach it with sufficient speed?

Suppose I start two men walking toward that target and tell Williams to run for it. What would happen? He would strike against these men. He

might be able to push them over from what I can see of him, but you will admit his efficiency to reach the target would be diminished.

If Professor Bachem is using a certain type of apparatus with a certain form of wave, they are calibrating on their own apparatus and giving us drafts absolutely reliable for their own. We could not borrow them and use them immediately in a Wâppler, Victor or another machine that has a different physiognomy as far as the waves are concerned.

We must imitate our German confreres in the thorough work they have done. They have shown us how to do it in every step, but we must apply these methods of investigation to whatever apparatus we have here. It is either a question of buying their apparatus and using their drafts or buying our own and having somebody else, the Schmitz and others, make drafts for us. That is, I consider, the point.

It brings me to one thing: People have been talking to us about service, offering us service suggestions. These service suggestions and others contain a good deal of advertisement for certain machines and a good deal of abstracts from Kyle and others. When we had read all of this we came to a last paragraph that told us that this was no good to us at all. That was the truth. It might have been said at the start. It was true. The only service that would be of any good to us would be that of Professor Schmitz. Dr. Erskine, who has done good work on it, should try out the particular type of machine with a spark length under different conditions.

They have not stressed the great factor of the geometrical form of the patient. Dr. Bachem stressed it. If you take a thin woman, so thin you could feel her pulse by her abdominal aorta you should not expect to use the same quantity of radiation as for a big, fat woman. I hope you see exactly the great importance of this, building up the patient into geometrical form. If that is done for us by the people who are in a position to do it—I am not for the moment, and you are not, many of you —if that is done for us in a thorough manner by the people in a position to do it, we have made a step forward.

We have not defined our dosage, although we have defined it better by opening Dr. Ullmann's suggestion. It is understood that the percentage of the peak that is taken in our machines has much to do with the quality of the output.

What would be of service to us? As I see it, here in America, where as I have said before the conditions are different from those in Germany, if a man interested in research, a man having the sacred fire in him, a physicist, would (for a salary given to him by subscription of all radiologists throughout the country) pass from one city to another and visit and advise the different men—that would be a service. He could say that on a certain date he would be in Montreal and answer a certain question of interest to me. I would say, perhaps, that I would like to know the wave form of my current and he would say: "Here, sir, is your wave form. There are too many harmonics on this line. You must expect discrepancies. You, Doctor, in Quebec, have a rather good sign wave." "What is the output of my apparatus? Is my milliameter right?" Out comes the calibration standard and the milliameter is tested there with a resistance. "Yes, it is right," or "No, it is wrong." "What is the quality of my ray with this given machine pushed to its limit? What kind of a filter should I use? Is six enough?" "Yes, six is enough." "Is eight too much?" "Eight would be wasteful. If you use eight you have passed the practical homogeneous point and wasted your energy."

The electroscope I consider a very, very precious thing. I know that Professor Esaire Eolimeau in France has a similar apparatus. We have gathered that Professor Wintz uses it over-time.

After reading part of the work of Professor Wintz, I am in a position to say he has done much of his work with a water phantom and says himself with calibrated tubes and given standards he uses arithmetical computations as we do. When he uses ionization chamber he estimates error at five per cent.

I would ask that you all think of this idea and if somebody finds it practicable, if this society finds that it can be done, there is not one of us here present who would not give $25 annually for the kind of service we would like. I am sure we have in this room men who would pay and overpay the salary and traveling expenses of a physicist willing to help us. (Applause.)

CHARLES GOOSMANN *(Cincinnati):* Mr. President, Ladies and Gentlemen: I do not think any of you appreciate any more than I do the brilliancy of Dr. Pariseau's mind and the brilliant ideas he is giving us, but in spite of that I will say I am using these Dessauer charts carefully and without any expectation of going the limit immediately.

I believe they are accurate for this reason: Dessauer made them on the transformer, on the Viva Transformer. We are using them on the two hundred kilovolt transformer, but even if the difference were as Dr. Pariseau says, the difference, for instance, between the wave of a coil and the wave of a transformer, it would not, in my opinion, detract from the value of the chart because after we filter out the soft rays and the medium rays, after we filter with a half millimeter of copper which is the least I think that we will use, we are practically using only the peak, only the crest of the wave.

I know that ten years ago Guilleminot showed that ten millimeters of aluminum gave a homogeneous radiation. He did not use the transformer as I recall it. He used a coil. He was working at a time when we knew very little about what x-ray really was. We knew nothing about it before Lowrie's work. He showed that ten millimeters of aluminum gave practically a homogeneous ray. That is, the absorption ray was practically a straight line. That means that the rays are homogeneous for practical purposes. We find that a half millimeter of copper is homogeneous for practical purposes and is equivalent practically to ten millimeters of aluminum.

In ten years we have learned that the man's work ten years ago was practically as accurate as ours is today.

Kroenig and Friedrick have gone further and said that a whole millimeter of copper is more nearly homogeneous, more perfectly homogeneous. They went further and instead of using absorption for their tests, they used spectrum. They found after filtration through one millimeter of copper, instead of a half, the rays were anything but homogeneous. In other words, true homogeneitty is impossible for us to achieve. We will never get down to a single wave length.

As I say, the French research workers showed ten years ago that that was approximately obtained with ten millimeters of aluminum. The Germans show it was a half millimeter of copper. In other words, they were correct in the first place. At the time that Friedrick and Kroenig changed the technique, if instead of changing portals of entry, twenty, forty or sixty, they had kept the old Albers-Schoenberg technique of long target distance, long target entry and added aluminum filtration, they would have done more for roentgen therapy than they did. They put us back somewhat. We are coming back to the Albers-Schoenberg technique.

He used thirty-eight arbitrarily because he could not afford to spend the whole day on the treatment. He used a large portal of entry. The tubes did not emit sufficient ray. With the Cooldige tube we can get the ray. If we will use an Albers-Schoenberg technique with the Guilleminot filtration, we have the modern German technique.

I believe there is a great deal in the new technique, from the little experience any of us have had, and I believe it so much that I borrowed some money to bet on it.

The important thing that I have taken away from this meeting is a conviction, a very determined conviction that I am going to do some funny stunts on the next carcinoma of the breast. I have a patient doing nicely with radium needles, heavily filtered x-rays. If she gets any more treatment, it will be like this: I will make an "L" shaped piece of wood, a little right angled piece of wood, and get either some water bags, preferably made out of animal bladders rather than rubber, or else I will get somebody to make a nice batch of dough or paraffin and mold it under that so I have a perfectly three-sided chest and I will give a treatment from the front, from behind and from the side, using the Dessauer chart for determining the dosage. I believe we are going to get better results than by simply shooting it on the surface.

If Dr. Pariseau is right, I am going to be in trouble in the near future. I am going to use these slowly, carefully, very carefully, and keep my fingers crossed during the whole performance.

I believe here is the whole secret of the thing. If we consider that Dessauer's charts are made for a purely relative purpose—he does not say what is your surface dose, he says "If your surface dose is one hundred per cent," then your deep dose is so much under the other conditions. I am pretty sure from my talk with him in Washington and from the reading of the literature, we are safe in reading these charts if we do it carefully. (Applause.)

DR. SCHMITZ: Dr. Bachem and I have discussed one point concerning the effect of absorption, rates of intensities, using different sign ways, etc. He wishes to make the following statement: By determining the total absorption factor known, he places at 0.14 to 0.18, the loss of absorption of the primary radiation as well as that of the scattered radiations taken into consideration.

Any radiation that has, for instance, the 0.14 will give us the same intensities. Absorption curves that have been determined for a current that possesses a total absorption factor of 0.14 intensity currents will hold good. It makes no difference whether you use a continuous sign wave or these interrupted waves or whatever they are.

Another statement is this: Ten millimeters of aluminum do not correspond in their absorption of filtering quality to one-half millimeter of copper. One millimeter of copper is equal to twenty-three millimeters of aluminum. Ten millimeters of aluminum are equal to 0.4 millimeters of copper. If you take that into consideration you will get it.

DR. BISSELL: I wanted some one to explain somewhat the exact technique for obtaining this wax mold. It seems like a very simple thing to him, but it would be difficult for me to go about that. Does he build the frame work and fill it with the wax or how does he proceed?

DR. SCHMITZ: Equal parts of wax and paraffin should be used. It should be mixed thoroughly, softened in warm water and applied so it will adapt itself to the surface of the body.

Treatment of Focal Infection of the Throat by X-Ray as Compared with Surgical Removal of Tonsils and Adenoids*

W. D. WITHERBEE, M. D.
New York City

THE principle upon which this method of x-ray treatment is based might be stated as follows: both lymphatic and embryonic tissue are more easily destroyed by the x-ray than any other living tissue. The tonsil is made up mainly of lymph tissue, the small fibroid tonsil so commonly associated with rheumatism contains lymph follicles, of which the greater part is embryonic tissue, as evidenced by the mitotic figures. The embryonic tissue in the follicles of the large lymph tonsil is considerably less than is found in the fibroid tonsil. The remainder of the tissue in these follicles consists of mature lymphocytes. Therefore, it is possible to use very small doses of x-ray to promote the absorption of the lymphatic element of the tonsil, which will in no way interfere with any of the surrounding and adjacent cells or glands.

From the standpoint of infection the shrinkage of the tonsil and lymph tissue of the lateral and posterior walls of the throat by x-ray [2] will produce a drainage and relieve the distortion of the crypts throughout the entire mucous membrane, which is impossible by any known operative procedure. Out of thirty-six cases in which specimens from the crypts were taken thirty-two showed an absence of hemolytic streptococci and hemolytic staphylococci. This coincides with the results which have so long been obtained in acne vulgaris and also the results first obtained by Dr. Kennon Dunham, of Cincinnati, in the treatment of carbuncle. Recently Dr. Hickey, of Detroit, has carried out this treatment in a series of diphtheria carriers in which he was able to rid the throat of diphtheria baccilli in from two to four days, and this occurred in eighty per cent of the cases treated.

The technique is comparatively simple. In the average case we use a seven inch spark gap, five milliamperes, four minutes time, ten inch distance, and three mm. of aluminum as filter. The patient lies face downward, head turned to the side, the position and angle of the patient and tube corresponding exactly to that employed by the roentgenologist in making a radiograph of the lower molars on an x-ray plate [3]. The number of treatments is usually about eight, given at intervals of two weeks, and both sides of the head are exposed at each treatment. A special table [1] and board have been devised for the treatment of children.

Figure I. Apparatus consists of an oil immersed tension transfer and hot cathode x-ray tube in same tank. This is placed under the leaf at the end of the table. On the leaf is mounted an adjustable head rest with lead lined opening. On one side is the milliammeter filament control and also a switch for turning on the primary current. The filter is attached to the top of the transformer tank so that it can never be forgotten. Target distance is fixed.

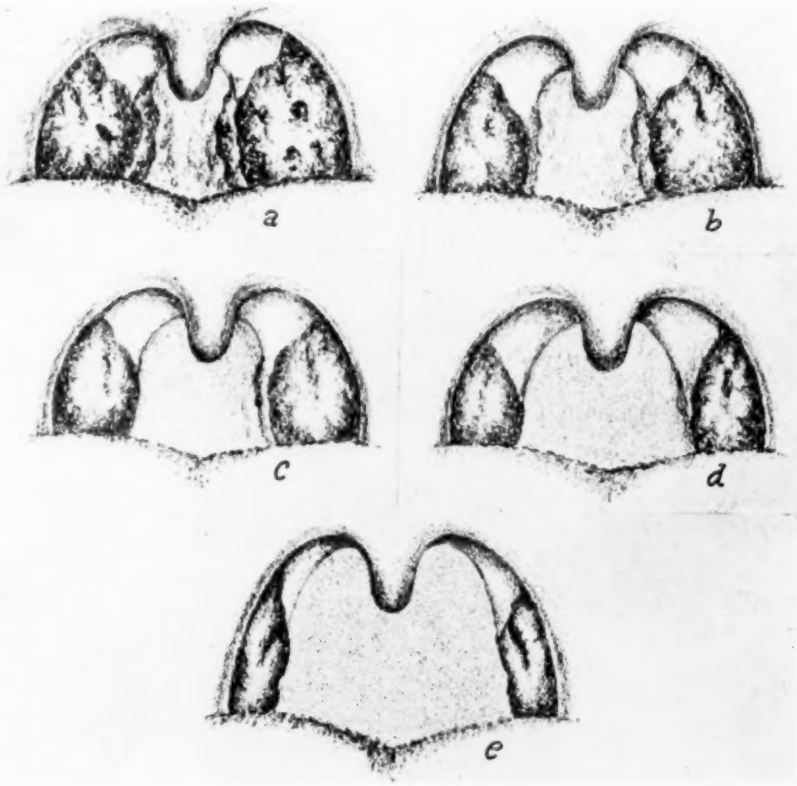


Figure II—a to e. (a) Tonsils before x-ray treatment; large, ragged, crypts contain pus. Large mass of lymphoid tissue behind posterior pillars. (b) Two weeks after treatment; tonsils reduced; surface smooth and clean. Mass behind pillars reduced. (c) Four weeks after treatment; tonsils markedly reduced pale and smooth; no exudate on deep pressure. (d) Eight weeks after treatment; small amount of exudate. (e) Six months after treatment; tonsils small, normal in appearance, no exudate on deep pressure. Lymphoid tissue behind pillars practically gone. Hemolytic streptococci disappeared from throat by second week after treatment.

*—Read at the Annual Meeting of The Radiological Society of North American, Chicago, Dec. 2, 1921.

The same technique, so far as the factors are concerned, is used in the treatment of tubercular glands of the neck and toxic goiter, the only difference being in the area exposed; in the goiter case we expose both the tonsil and the thyroid gland, and in the tubercular gland the tonsils and glands involved. Whether an infected throat has anything to do with the toxic goiter is a debatable point, however, I have seen one case sent into the hospital with an acute follicular tonsillitis which in forty-eight hours developed all the symptoms of toxic goiter. If the infected throat has anything to do with the action of the thyroid gland we might expect better results in these cases if the focal infection in the throat is relieved as well as the effect of the ray on the gland itself. In tubercular glands of the neck the removal of the focal infection in the tonsil and throat will also relieve the primary focus of infection and thus have more lasting effect on the tubercular gland.

The x-ray method of treating chronic focal infection of the throat, namely, tonsils and adenoids, is not only safe and permanent, but will more thoroughly and completely remove this focal infection than any other method yet devised, surgical or otherwise, and furthermore the contraindications for operation in no way interfere with this procedure. This method, as compared with surgical removal of tonsils and adenoids, is free from serious complications. Following surgical removal one may have all the conditions which arise from circulating septic emboli, lung abscess, empyema, phlebitis, endocarditis, etc., and hemorrhage, middle-ear infection and mastoiditis may also complicate recovery. In the x-ray treatment there are no known complications provided the technique is faithfully carried out. The permanency of the results as well as the safety of this method can easily be checked up by any man who in the past ten years has had a number of tubercular glands of the neck treated by x-ray. Van Allen's recent report of fifty cases in the December Journal of Radiology is most interesting and instructive.

Figure III. Shows position used in treating tonsils with the ordinary x-ray treating tube stand, the tube resting above the patient. The rays are focused over the tonsils by an indicator as shown by the illustration. The surrounding part of the skin is covered with lead foil.

The objections so far encountered to the x-ray method have been, first, the danger of x-ray, namely, a burn. This is impossible if the technique prescribed is carried out. The possibility of injury to the parotid, the thyroid, the pituitary, and other adjacent glands has been amply tested in the past ten years in which tubercular glands of the neck have been treated by much larger doses, some of the cases receiving as high as forty doses, whereas the dose for tonsils and adenoids has never exceeded fourteen treatments in any given case in a series of nearly five hundred cases which we have treated in the past two years.

In our series of five hundred cases we have encountered two cases of concealed abscess of the tonsil, revealed by the shrinkage. Both cases were suffering from rheumatism and in both instances the rheumatism was relieved in the early part of the treatment. These abscesses are completely circumscribed and walled off by fibrous tissue and are therefore inert. In one of the cases the abscess ruptured and drained about three months after treatment. *The fibrous tissue remaining after x-ray treatment and the encapsulation of these abscesses point out the fact that we leave only that type of tissue which nature utilizes in her defense against infection.* This method is especially indicated in chronically infected throats in vocalists, since the muscular reconstruction of the throat is minimum as compared with that following surgical removal of tonsils and adenoids; it is indicated also in those cases associated with rheumatism, chorea, diabetes, chronic endocarditis, haemophilia, or any condition contraindicating operation.

1. The Atrophy of Hypertrophied Tonsils and Adenoids and Other Lymphoid Structures of the Throat Induced by Small Doses of X-Ray.—Dr. J. B. Murphy, Dr. W. D. Witherbee, Dr. S. L. Craig, Dr. R. G. Hussey, and Ernest Sturn, *A. M. A. Jour.*, January 22, 1921.

2. X-Ray Treatment of Tonsils and Adenoids.—W. D. Witherbee, M. D., *Amer. Jour. of Roentgenology*, January, 1921.

3. The Principles Involved in the X-Ray Treatment of Tonsils.—W. D. Witherbee, M. D., *New York Med. Jour.*, March 16, 1921.

4. The Effect of Small Doses of X-Ray on Hypertrophied Tonsils and Other Lymphoid Structures of the Nasopharynx.—J. B. Murphy, M. D., W. D. Witherbee, M. D., S. L. Craig, M. D., R. G. Hussey, M. D., and Ernest Sturn, *Jour. of Experimental Medicine*, June, 1921.

X-Ray Treatment of Tonsils with the Conjoint Use of the Ultra-Violet Ray*

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THIS is not an occasion to discuss the method of election in the treatment of tonsillar diseases. It is conceded at the beginning that surgical indications exist and should be utilized; but it is also pointed out that there appears to be a class of tonsillar dystrophies in which x-rays serve eminently well as a therapeutic measure. This seems to be true, particularly in the case of hypertrophied tonsils in children; and it is exclusively upon this subject that attention will be focused.

In the child the lymphatic system is dominantly active, and since the tonsils may really be considered an integral part of the lymphatic system, we may expect hyperactivity in those organs in early age. Those of us who are in accord with the teachings of Colonel Bushnell with regard to the immunizing dose of tubercle infection sustained in childhood by repeated ingestion and aspiration of tubercle bacilli can see in the tonsils a locus through which the circulating tissue of the infant derives its immunologic defense against usual pathogenic bacterial flora. It is not improbable that the physical texture and the chemical constitution of the tonsillar glands are purposely adapted to bacterial culture; for, whether purposeful or not, in children it is a frequent finding to observe subacute infections commonly present.

Assuming that the tonsil, by reason of its position, its histologic texture, and its chemical constituency marked by lymphatic preponderance, is charged with the duty of collecting ingested and aspirated organisms, and also breeds pathogenic organisms in a subactive fashion, it is possible to conjecture a threshhold of maximum activity at which pathogenic organisms thrive to a point where focal or systemic infection is not clinically established, though the products of their elaboration are osmosed into the lymph and circulated and distributed throughout the body, raising generally the immunologic titer of the tissues against various infections. Or, to speak in terms of an established science, it seems probable that the tonsils are likely to contribute, during childhood, to the establishment of an immunity. An immunity acquired at so early a date as to be inseparable from the defense usually recognized as natural immunity.

Speaking only of hypertrophied tonsils in children, there will be observed in the clinic, in the light of the hypothesis presented, three types of tonsillar conditions:—

(1) Those in which the tonsils are obviously hypertrophied, but are not excessively reddened, suggesting by their appearance a minimum bacterial activity.

(2) Those in which an obvious reddening is present, suggesting a bacterial activity, but an activity below the point of clinically established infection.

(3) Markedly reddened and congested tonsils in which infection is clinically established as is evidenced by the accompanying systemic manifestations.

In the first instance, careful observation will develop the singular fact that the child may be classed as a hypo-ontomorph of Bean and shows a form of clinically recognized signs indicating a trend in the direction of status lymphaticus. In these cases, according to the terms of the hypothesis presented at the beginning, it would seem fitting to argue that the defensive processes against invading organisms outweigh the power of attack in such fashion as to preclude the establishment of any obvious degree of immunizing infection. Tonsils of this type are, therefore, hypoactive and bear treatment along the lines that will establish some degree of activity. It would seem that their surgical removal is not at all warranted; for the physical removal would not assist in accelerating a hypoactive function, but would, rather, by total removal of the immunizing organ, preclude the possibility of any degree of immunizing activity. And in this type of case, if the premises of the immunizing hypothesis are correct, the therapeutic use of the x-ray should be followed by marked success.

Here, the x-ray will reduce the size of the tonsil, through which reduction there will be a proportionately less volume of immunizing surface and material; and if the reduction is carried to the degree where the usual pathogenic organisms may establish their subactive function, the immunologic defense of the child will be placed at normal adjustment. In support of this hypothesis may be cited the unusually brilliant results that follow the reduction of hypertrophied tonsils in hypo-ontomorphs by the use of x-rays. In observations confined to school children of the lower grades the outstanding feature of the improvement seems to be the reflection in the intellectual background and study interest, both are awakened in the previously dulled and intellectually insipid pupil.

The second type, pursuant to the theme submitted, comprises the large majority of school children, in which the tonsils present what we should like to refer to as a state of active immunization. The glands are enlarged, less spongy than the previous type, reddened, but not abnormally so, and give, on culture, more numerous and greater varieties of organisms than the hypertrophy of the first class. In these cases it is contrary to best judgment to intercede with an agent or means that will totally remove the tonsil should indications arise for their treatment. The tonsils appear to be playing a markedly active part in the physiology of the child; and should conditions arise that demand treatment, such as physical obstruction to proper aeration, it is the better course, at least at first, to resort to the use of x-rays in preference to surgery.

In this second type, however, the general systemic level of the child may, for whatever reason, fall markedly below par; and when it does the tonsillar infection acquires a new proportion requiring clinical intervention.

Any form of intervention should be based upon two fundamental principles: First, the immediate correction of the excessive bacterial activity, and secondly, the moderate reduction of the immunizing capacity of the tonsils so that any future impairment of systemic normalcy will not be followed by outburst of focal tonsillar infection. And with these two indications there is a contraindication, the strict avoidance of the removal of the tonsils. The very fact that the tonsils are subacutely inflamed at all times is sufficient index to show the necessity for raising the general immunity of the individual. Surgical removal of the tonsils would preclude the possibility of maintaining this immunizing mechanism after the acute aberrancy has subsided. In this type of cases the x-rays were not as singularly successful as in type one; and the difference in success was attributed to the non-bactericidal action of the x-ray. In other words, the x-ray accomplished

*—Read at the Annual Meeting of The Radiological Society of North America, Chicago, Dec. 7, 1921.

the second indication, but entirely failed in the first indication for treatment; that is, it eventually reduced the immunizing activity of the glands, but it failed immediately to correct the acute infectious exacerbation. So that the x-ray treatment in class two should be supplemented by a form of treatment aimed directly at the immediate cessation of the infectious activity. An agent remarkably suited for this indication is the ultra-violet ray. Through its bactericidal influence the acute infection is quickly dominated and the clinical symptoms are therefore speedily removed.

Coming now to the discussion of the third clinical class of hypertrophied tonsils in children we observe the manifestly infected glands. There is a clear and distinct difference between the gland showing active immunologic processes, and the obviously infected tonsils. The characteristics of the former type have been discussed; the features of this third type are well known and may be summarized by saying that the differentiating symptom is the presence of purulent accumulations. Not simply leukocytes scattered over the surface, but definite gatherings of pus in the crypts and spaces on the surface and in the mass of glands.

This type of tonsil is decidedly pathologic. The use of the x-ray, owing to the lack of immediate bactericidal effect is wholly impractical; and even the powerfully germicidal ultra violet ray alone is far from the most efficient treatment. The indication is not to relieve the pathogenic infection, for even if it were relieved, the major immunizing influence of the gland has been lost through the changes induced by the severe pathogenic inflammation, and will, therefore, contribute little to the immunologic well-being of the child. In these cases, again in the light of the hypothesis presented, the indications are for the surgical removal of the gland.

All of this may be summarized by saying that tonsils in children are divisible into three groups, based on their supposedly immunizing function—

First, the hypoactive.

Second, the active, and,

Third, the infected.

In which we distinguish between immunologic activity and pathologic infection. The immunologic activity is characterized by the thriving of many organisms, saprophytic and pathogenic, below the threshold of clinical infection; whereas, infection is characterized by the presence of one dominant strain of organism that has established an activity that no longer contributes to the physiologic manifestations.

In these cases our experience with school children has been that when treatment is indicated because of the temporary establishment of an acute infection, or because of the mechanical impediment to normal physiologic processes, better results are obtained in the discriminate use, either alone or conjointly, of the x-ray, the ultra violet rays and surgery; the x-rays being reserved for the hypoactive tonsils, the conjoint use of x-ray and ultra violet rays being especially beneficial in the cases of type two, and surgery being reserved for cases of type three.

The use of the x-rays is already well familiar to every roentgenologist in the form of the Witherbee technique. When it is to be supplemented by the use of ultra-violet rays, the x-ray applications are given every two weeks, as is generally advocated by Witherbee and others; the ultra violet irradiations are applied directly to the tonsil through a pharyngeal applicator in units of actinic saturation, alternating days in the usual case, and daily in the more severe infections.

The choice of surgical operation is left for surgical specialists to decide.

Since the active immunizing types are by far the most frequent that are to be observed clinically, it is obvious that the ultra violet ray plays a significant role in the treatment of tonsillar pathology. The indications are plain, the application is simple and the results obtained through the conjoint use of the x-ray and ultra violet ray in hypertrophied tonsils are eminently brilliant and deserve every consideration.

Radiotherapy of Diseased Tonsils*

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IMMEDIATELY following the announcement of Witherbee and his associates that the x-ray caused atrophy of the adenoid tissue in the tonsil, radiologists realized that they had seen this again and again in their cases of cervical adenitis and hyperthyroidism, but for some reason we had not thought to limit our ray to the tonsil.

It is now about a year since the radiologists, generally, began using this method of treatment, and it may be of interest to take a survey of the field and examine the results. There are two things which we cannot answer positively at present.

First—How long will the results last? That is, will new cells form in a few years and the patient again suffer with tonsilitis? All that we can say at present is that in adenitis cases in which the tonsil received treatment, no further trouble was experienced with the throat, and some of these cases have been observed over a period of six years or more.

Second—What histological changes do we find in the different types of diseased tonsils after treatment, how long do they persist and do any regenerative changes appear? The patients are so much improved after a few treatments that we have had no occasion to resort to surgery with any of them, and have, therefore, been unable a few months after treatment, to get a study of microscopical sections.

Taking from our files the first fifty cases treated, we find that they fall roughly into four classes, as follows:

First—Adults having large, soft hyperplastic tonsils with deep crypts, generally discharging or containing pus.

Second—Children with large, infected tonsils and crypts, generally not so deep.

Third—Adults who have had their tonsils, or at least part of them removed and who still have a part of the tonsil with scar tissue present.

Fourth—Both adults and children who have had the entire tonsil removed and have infected and enlarged lymph follicles in the pharynx.

The first class is the type that shows startling improvement. The tonsils shrink rapidly, the crypts can be seen standing wide open and the cultures show wonderful decrease in the number of bacteria. The patient is delighted to find that he stops having tonsillitis and other throat trouble. Of this type we found twenty-nine cases, of whom five stopped having tonsillitis after one treatment, three after two treatments, and the remaining twenty-one received an average of five treatments. The results were satisfactory,

*—Read at the Annual Meeting of The Radiological Society of North America, Chicago, Dec. 7, 1921.

both to us and to the patient, and we have not thought it necessary in any to give a second series.

The second class of cases are the children with large, infected tonsils. The child normally has a large tonsil, so it is not the object of the treatment to cause complete atrophy, but to cause the diseased portion to disappear and the infection to clear up. This will probably cause the tonsil to atrophy normally as the child grows older. Of this class we found eleven cases. Average number of treatments was six and two-tenths. Results appear perfect in ten. One did not complete the treatment.

The third class is a rather puzzling type. The tonsils have been partially removed, either by surgery or by sloughing and there is present a large amount of scar tissue along with the lymphoid tissue from which pus and debris can be expressed. Generally they consult a doctor for a constitutional trouble rather than a throat condition. These cases always declare that the general symptoms improve and certainly the throat looks better and is free from pus, through there is generally some of the roughened tissue left between the pillars. We found in this series only four of this class, all of whom improved with an average of eight treatments.

In the fourth class we find both adults and children. Again and again we see patients who have had their tonsils removed and have experienced only partial relief. They complain of constant discomfort in the throat with constant desire to clear it and a well defined attack of sore throat at frequent intervals. There is generally not the prostration that typical tonsillitis causes, but a very uncomfortable feeling with slight fever.

Upon examination of the throat, we find a varied condition. In some cases the enlarged follicles are seen covering the whole pharynx and pillars or occasionally just behind the pillars or in the lower angle of the pillars. Generally the entire Waldeyer's ring seems to be involved. The adenoids have generally returned and the lingual tonsil is generally enlarged. The local treatment is only of temporary benefit, and as far as I have been able to observe the x-ray has the most pleasing and permanent effect, although the effect does not appear quite so quickly as in some other types. We have in this series, six cases. Results are apparently good in all, but we are reserving our final opinion in order to watch these cases for a period longer than a few months.

As to technique, we are using in most cases that recommended by Witherbee, viz.: in adults, five ma., seven-inch spark gap, ten-inch distance, three mm. aluminum, four minutes every two weeks, and children proportionately less. In patients from a distance we use the large dosages, and longer intervals. The greatest number of treatments we have given is twelve.

We would like to draw some conclusions in closing this paper, but aside from the immediate results that are very evident and satisfactory, we prefer to wait for a longer time to formulate our final conclusions.

DR. JOSEPH BECK *(Chicago)*: The last paper was a paper that interested me the most and I am sure every laryngologist who has been interested in the removal of or the remedial measures for infected tonsils, especially in children, will want to read that paper, because it is certainly rational, although I am sure we have all been keeping away from tonsils in which we felt there was a hypoactivity or a condition in which the child required the lymphoid tissue. That is the first point I want to make in discussing the paper of Dr. Witherbee.

I have followed this work ever since it was reported in the American Medical Association and put it to work, though not as actively as I shall after this meeting. I have been waiting for this meeting.

The lymphoid tissue negation by the first speaker, Dr. Witherbee, and attributing the formation of connective tissue as a protection against infection is against all physiology so far as I know, and were we able to get rid of infections in tonsils without removing the tonsils, that is the operation we would choose, if there was such a possibility. It is a protection even in the adult, but the infection is in the crypts. The crypts are lined with epithelial cells. X-rays do not destroy those. You can see tonsils that have been rayed a number of times, remove them and the epithelium is degenerated and holds pus sacs.

In cases in which the indication is so clear as endocarditis, and so many other distinct indications for the removal of tonsils, are you going to treat a pus sac by x-ray? I say there is no place for x-ray in a condition of that kind.

The pictures that were shown of massive tonsils with lymphoid enlargement are an old story. X-ray removes lymphoid tissue, but does it remove the infection? We have to see the reports and describe the action of the x-ray. They are not bactericidal; other rays must be used and therefore, that presentation to me is no criterion whatever. If I heard Dr. Witherbee's paper I should not be encouraged in applying x-ray as a means of treatment. My experience in so far as x-ray treatment is concerned has been limited to cases where surgery was contra-indicated, as in pulmonary tuberculosis, in which there was an infection, there was a distinct septic infection in the tonsil. Second, hemorrhagic tonsil; I mean spontaneous hemorrhage of the tonsil in a definitely proven bleeder. Third, a case of glycosuria, diabetic, where there was an enormous amount of sugar in his urine. The patient was seventy-six years old and we would not operate. For that kind of a condition that would be indicated. To me the last speaker's paper will be of value in trying the x-ray as well as possibly the other ray. I do not treat with the x-ray, depending upon the radiologist to do that work, and trying to follow the technique as Dr. Witherbee presented it. I think we are indebted to Dr. Witherbee for presenting the paper, but at the same time the conclusion to open the subject by making the statement that there is no need for surgery, I leave to you if that is sound judgment. I thank you. (Applause).

DR. AUSTIN A. HAYDEN: I have been interested by the papers which have been read. I have been considerably resuscitated by Dr. Beck's very forceful remarks.

I saw the pictures which the doctor was showing and heard his remarks about the non-necessity for removal of tonsils and I must say I felt very uncomfortable. However, gentlemen, I realize from the work I have seen some of the members of your society do in this connection, more especially, however, from the work that I have seen them do in the treatment of goiters, that the opening up of this field by an association of the standing your society has, is a distinct advance and may be—and I emphasize the words *may be*—a very considerable advance in scientific medicine.

Just as Dr. Beck said, however, we cannot but look with a considerable amount of skepticism on the treatment that has been advocated for septic tonsils, for instance.

I have been unfortunate enough to have been visited with such an infection a few years ago, and the results of that I feel sure with the multiple arthritis I had, with the glycosuria, I do not feel for a minute I would have been safe to have placed my case in the hands of a radiologist exclusively. I think those conditions are surgical and will always remain surgical. However, if I understand the question correctly, the changes which the rays produce or which the violet rays produce (I have not used these myself; whatever work has been done by members of your

society), I do not understand that these changes are essentially different from the changes which physiologically occur in every tonsil in middle life or after puberty has been reached. The general contraction of all gland tissues which occur, physiology shares in for that reason. Hypertrophy of tonsils in adults is extremely rare, large tonsils being seen in children.

For the cases which do not seem to be infected, but which are obstructive (that is, which obstruct the passage of food or the passage of air or the ventillation of the posterior larynx or ventillation of the eustachian tubes), in which there is no suppuration, no sinus disease, no running ears, I would be inclined to think that the methods you gentlemen have proposed this afternoon are strictly in order and probably will be found to be permanently, highly efficacious. For the tuberculous conditions Dr. Beck has spoken of, for the suppurative conditions within the tonsil crypts, I must say that I view the suggestions that have been made with great hope, but, however, with great skepticism. I thank you. (Applause).

DR. MCCANDLESS: There is a tendency to argue the question rather than to bring out the scientific factors in the work. One of the chief arguments in favor of our work was brought to my own mind from the fact that when this subject was first mentioned to us, I began examining those patients who have had heavy exposures of the cervical and tonsillar area in cases of epithelioma of the lower lip—cases that had been treated some five and ten years prior to the examination.

These, of course, were adults, largely. In these adults it is presumed they have the throat of normal adolescence and that we would find there the mucous membrane a smooth, shiny, velvety affair that one would expect in a normal adult. After having examined these throats, I attributed much of the result, that is, this velvety mucous membrane to the effects of the ray. I still think there is a marked difference in the appearance of this mucous membrane in those patients so treated and the usual adult throat. The juvenile type of tonsil when it is found in the adult is, of course, rare. We have found in one patient at the age of seventy, the gross appearance of juvenile tonsil. That patient was a sufferer from rheumatism—quite an old lady. After some eight or nine exposures after the technique mentioned here, the results were relatively satisfactory. There was quite an appreciable relief in the rheumatic trouble complained of.

Of the five doctors on our floor that have been treated, one was a sciatic case with relief having come. In considering our results, it is a question of relief from pathology. The decrease in the size of the tonsil, of course, has given these patients very much more room for breathing. That is conceded by all of us.

Getting back to the question of infection, I do not know what has taken place in these throats, because either the patient refuses operation afterward because of dread of the knife or assumes that he has been relieved. They will possibly resort to subterfuge to avoid tonsillectomy after our work.

Relative to the permanence, all of us who have spent any number of years in this work, know that the gland atrophy in other parts of the body is a relatively permanent thing. No recurrence of glandular tissue is to be looked for after long, continued radiation. I believe that more work is required to produce the results in these tonsil cases than we have been using. We have increased some of these treatments—increased the number of ten, eleven and even as many as fourteen treatments. The relief from the rheumatic pains has been the greatest result obtained in the adult. In the children, of course, the regression of the lymphoid tissue. I see no great disadvantage in using this agent first. It is scarcely fair to bring up the problem of lung infections and the untoward results that have occurred after surgery and use them against the nose and throat man. It engenders an antagonism that I feel will not promote this new work. That seems to me to be extremely valuable.

I hope that in the number of cases, representing about seventy-five now, we will be able to get a compilation of throat cultures, of throat measurements. We are trying to measure the distance between the tonsil and the throat in relative repose. Later we hope to get the removed tissue for section, which we have not been able to get yet. I feel we have made a definite advance. Dr. Beck said that pus pockets must be removed. I do not believe there will be a great amount of controversy if you will choose those cases. In the light of another year or two we will be enabled to choose cases suitable for work. (Applause).

DR. WITHERBEE: Gentlemen, as far as the nose and throat man is concerned I can see his viewpoint and handwriting on the wall. I am not talking of a few cases. I have treated between four and five hundred cases and I think I know what I am talking about. (Applause).

In regard to the infection in these crypts, I do not think that any one can fall down on this sort of a proposition. If the crypts in the tonsils are filled with infective material, treat 'em. You have done away with the crypts if you carry it far enough. Who cares how they are lined?

I have heard a great many of these propositions against the use of x-ray in tonsils. Now let us go back a little bit in the history of this organization. This is not new. It is like a lot of other things. You have all done a great deal of therapy. You have treated tubercular glands in the neck. Many of you know that the throat man said: "Clear up those tubercular glands in the neck and when you get through I will take out the tonsils."

Tubercular glands have been treated for ten years, at least. Why do I say that the results are permanent? Examine these cases treated ten years ago, in which the whole side of the head was treated by x-ray and look at those throats. I have seen some well four years and no trace of trouble whatever.

Since we introduced this treatment we have exposed only this small area from the ear to the hyoid bone. We have, however, heard a great deal about complications from the x-ray, its effect on the parotid, on the thyroid, on the pituitary and all that stuff, when previous to this the tubercular gland case received ten times as much treatment as you have to give tonsil cases and we never heard anything about ill effects.

If you think of that from the standpoint of ringworm of the scalp, how many children have been treated for it? The technique requires five portals of entry, all directed at the pituitary gland, no result, thin skull, small children. I guess that is all.

Organ Stimulation by Roentgen Ray*

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IN reviewing the therapeutic accomplishments of irradiation in internal medicine one gains the impression that the yield, despite the great amount of time and investigation spent in the field, has been very modest. Excluding tumor work, we find successful application in the leukemias, the lymphogranulomas, in some forms of tuberculosis, in thyroid dysfunction—a relatively moderate return in therapeutic results, particularly if we contrast this with the marked development of the diagnostic use of the roentgen ray.

Popular and even medical attention has always centered about irradiation in connection with malignant tumors. This has involved, naturally, the idea of tissue destruction and as a result roentgenotherapy has been oriented almost wholly about this particular phase of the effect of irradiation, rather than about other and perhaps more useful effects that can be achieved. I believe that this fact has been most unfortunate in the proper development of its therapeutic possibilities.

It is a fundamental biological law, and one to which there are but few exceptions, that agents which in large doses injure or destroy tissue, will, in minute or moderate dosage, act as stimulants. Virchow as early as 1858 recognized this fact, but the broad basis of the phenomenon was not generally accepted until the papers of Arndt and of Schulz appeared, since then it is commonly called the Arndt-Schulz law. Might it not be possible that the therapeutic yield of irradiation would be materially extended if this old Arndt-Schulz law were more commonly considered by the roentgen therapist? It seems that, probably by largely stressing the destructive effects of irradiation, we have neglected the development of a field of roentgen therapy in the direction of selective functional tissue and organ stimulation.

The diametrically opposite effects of irradiation that has its basis on dosage, has been sufficiently impressed upon us by the formative stimulation of small doses, which, long continued, will produce malignancy, while the same rays employed in different dosage may cure a malignant condition. We see the functional effect frequently enough after thyroid irradiation, where the metabolic rate and the general symptoms of intoxication may be augmented for a period of days or even weeks after treatment. Schmidt [1] in a recent histological experiment has demonstrated this general phenomenon in a beautiful manner. He observed cells exposed to roentgen rays for varying doses, and noted that those cells that received a stimulating dose took up vital stains more readily, those that received a somewhat larger dose were stained more diffusely than the normal cell, while cells killed by massive doses took up no stain at all.

We were led to a study of this particular problem because it forms a collateral field of nonspecific therapy. It is recognized that one may at times achieve quite remarkable therapeutic results in acute infections and in chronic inflammatory conditions when a variety of agents—these include vaccines, milk, protein split products, colloidal metals, etc.—are injected either intravenously or intramuscularly. The results, when this form of therapy is successful, are due to tissue stimulation, either general or local. The Germans use the term "plasmaactivation," the French emphasize the serum alterations which follow such procedures and speak of the "hemaclasic crisis." Included in these general terms are the mobilization of antibodies, of enzymes, thromboplastic substances, tissue metabolites, glycogen, etc., as well as important alterations in the permeability of cells. We believe that in certain diseases a general stimulation, such as is involved by "protein therapy" might not be desirable; would it be possible in some cases to selectively stimulate certain organs and thereby bring either direct or remote therapeutic results? In the second place we would have to consider the possibility that the general reaction that follows irradiation, particularly of the abdominal region or of large tumor areas, etc., may have a therapeutic effect in the sense of a protein therapy. We shall not go into this latter possibility at the present time, but wish to point out that Kaznelson and St. Lorent [2] as well as Giraud and Pares [3] have recently presented evidence that such may actually be the case.

In our own investigation we found that functional *stimulation* of an organ might readily be observed, following moderate doses of roentgen rays, in organs having an external secretion, such as the liver, the kidney, etc. In the case of the liver, the stimulation was apparent in both an increase in the quantity of the bile flow as well as in the amount of bile pigment secreted; in the case of the kidney by an increase in the amount of urine as well as the total amount of nitrogen secreted.

In the following protocols are shown the effects of kidney irradiation on the amount of urine secreted. The experiments were carried out as follows: The dogs were anaesthetized, the ureters isolated and catheters inserted. Next, the circulation of both kidneys was clamped off and the clamps left in position for forty-five minutes. During this time and following throughout the experiment the animals were kept under large doses of morphine. The clamps were removed after forty-five minutes, then one kidney was rayed, the dose varying from five to ten minutes, ten inch focal distance, six inch spark, three ma., no filter.

Dog No. 90—Renal vessels clamped at 2 P. M.; at 2:45 irradiation of right kidney.

URINARY SECRETION

		Left Kidney	Right Kidney
First sample	6 P.M.	2.3c.c.	4. c.c.
	7 "	1.2c.c.	4.8c.c.
	8 "	1.4c.c.	7.6c.c.
	9 "	1.4c.c.	5.1c.c.
Totals		6.3c.c.	21.5c.c.

Dog No. 91—Renal vessels clamped at 7:30 A. M.; at 8:30 irradiation of right kidney.

URINARY SECRETION

		Left Kidney	Right Kidney
First sample	9:45—	0.	0.
	10:45	0.	0.
	11:45	0.	1. c.c.
	12:45	0.	1.5c.c.
	1:45	0.	1.6c.c.
	2:45	0.	1.5c.c.
	3:45	0.	2. c.c.
	4:45	0.	2. c.c.
	5:45	0.2c.c.	1.1c.c.
	6:45	0.5c.c.	.8c.c.
	7:45	0.5c.c.	.5c.c.
	8:45	0.2c.c.	.2c.c.
Totals		1.4c.c.	12.2c.c.

Not in every case were the results as clear cut as in these two experi-

*—Read at the Annual Meeting of The Radiological Society of North America, Chicago, Dec. 8, 1921.

ments; in some instances the anaemia was too prolonged and no secretion took place from either kidney; in some experiments the irradiation was not sufficient to stimulate the renal epithelium to greater activity in the relatively short time permitted in experiments conducted in this manner.

If we examine the subject of functional organ or tissue stimulation in its clinical application we must consider two methods of approach. The first is a direct method in which we seek to stimulate a hypo or dysfunctioning organ to greater activity. Under this head we might consider the *anurea* in an acute parenchymatous nephritis (as simulated in the kidney experiments described), stimulation of the liver in *hepatic intoxication*, operative, cirrhotic, etc.; stimulation of the bone marrow in certain forms of *anaemia;* stimulation of the endocrine organs, such as the ovaries in functional amenorrhoeas, the testicles (as in the Steinach experiments); the hypophysis in *growth disturbances*, and perhaps in some types *of polyurea;* the adrenals in *Addison's Disease;* the pancreas in *diabetes.*

A number of German roentgenologists have become interested in recent years in therapy along these lines and a series of observations has been collected. To Stephan [4] we perhaps owe the clearest recognition of this direct effect of roentgen rays on hypofunctioning organs. Stephan's paper takes up very thoroughly the theoretical basis for the work and he illustrates his conception with three clinical conditions, that is, diabetes, acute parenchymatous nephritis and achylia gastrica, in which stimulating doses of roentgen rays brought about distinct functional improvement. Fraenkel [5], too, has insisted on the importance of therapeutic irradiation from this point of view. Thus he stimulates the ovaries in cases of amenorrhoea, the periosteum in old, poorly healing fractures; the thymus and hypophysis in osteomalacia, and has, in several papers called attention to the effect of remote irradiation on tumor treatment, believing that our present methods of huge doses will be found of less value than those methods which stimulate the natural forces of the organism to greater resistance to the invasion of tumor cells (connective tissue reaction, enzyme mobilization, lymphocytic reaction).

Stettner [6] has followed the same idea in raying the hypophysis in growth disturbances. Levy and Weinstein [7] sought to establish a stimulating dose for the adrenal by measuring the effect on the blood pressure after regional irradiation. They came to no definite conclusion, however. Szego and Roth [8] in studying gastric secretion after irradiation found that only doses greater than an erythema dose gave first evidence of irritation, to be followed later by depression. Brugel [9] found only a lowered secretion after irradiation. On the other hand, it is to be recalled that irradiation of the gastric region (entailing as it does simultaneous effects on the liver, the pancreas, the spleen and the colon as well as loops of the small intestines) is most frequently followed by evidence of intoxication (Miescher) [10] the effect of which must naturally influence the stomach secretion.

Perhaps one of the most interesting applications of this idea is that which concerns the pancreas. We shall not go into the extensive literature concern-

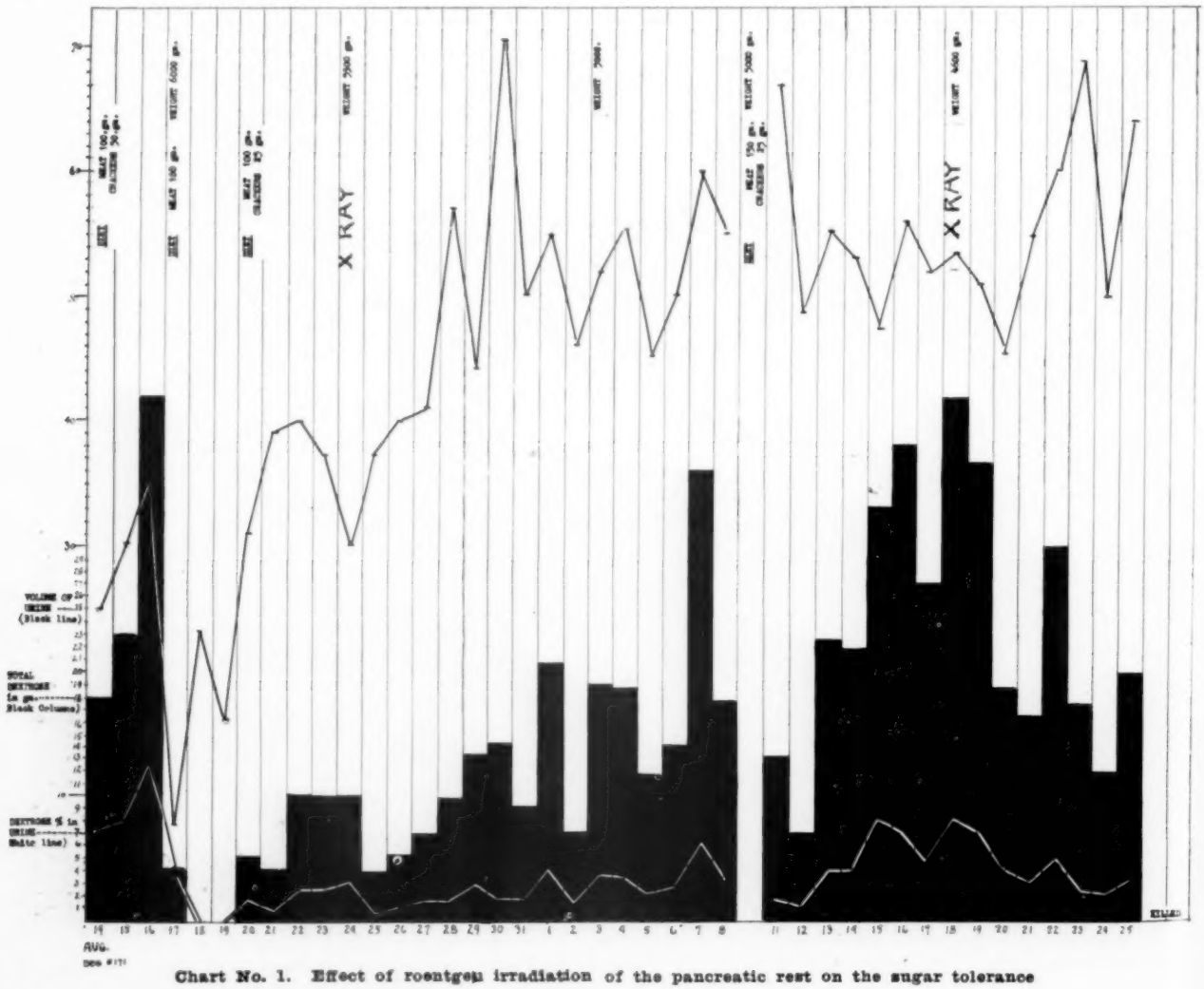

Chart No. 1. Effect of roentgen irradiation of the pancreatic rest on the sugar tolerance

ing the effect of irradiation on the diabetic individual. The general experience has been that irradiation, particularly of the abdominal viscera, or of neoplasms, results in an increased sugar mobilization. This corresponds to the general effect that we get in the diabetic after protein therapy, after hemorrhage, after adrenalin injection, etc. Apart from the work of Stephan no efforts have heretofore been reported dealing with the direct stimulation of the pancreas; we should, therefore, like to present some experimental evidence in this connection, carried out on partially depancreatized dogs. The animals were, of course, kept on a constant diet and the effect of irradiation on the sugar output studied.

The following two experiments are typical and similar in character to those which we previously described [11].

Dog No. 171, Chart No. I.—Weighed 6800 gm. Operated Oct. 7, 1921, when 14 gm. of pancreatic tissue were removed. The animal made an uneventful recovery and began to excrete sugar on the 4th day after operation. On the 14th the animal was placed on a diet of 100 gm. meat, 50 gm. of cracker meal and 200 cc. of water. On this diet the amount of sugar reached 42 gm. excretion on the third day and the animal refused food. The cracker meal was then eliminated from the diet for three days, after which twenty-five gm. were again added. On this diet approximately 10 gm. per day were excreted (Oct. 23 and 24). The animal was irradiated on the 24th of the month (10 minutes, no filter, 3MA. 5 inch spark and 10 inch focal distance). This was followed by a definite reduction in the sugar excretion to 3.07 gm. on the following day, with a step like rise in the days following—5 gm., 6.8 gm., 9.7 gm., 13 gm. After this time the sugar excretion was irregular. On Nov. 11 the diet was increased by 50 gm. of meat, the amount of carbohydrate being kept as before. The animal was again rayed on the 18th. The average excretion for the seven days before the irradiation and including the day of exposure was 27.3 gm. The average for the seven days after exposure was 21.6 gm.

Dog No. 105, Chart No. II.—Weight 12,400 gm. Operated July 13, 1921, when 23 gm. of pancreatic tissue were removed. The animal made an uneventful recovery and began to excrete sugar on a diet of 200 gm. meat, 100 gm. cracker meal and 50 gm. of dextrose. The amounts are made evident in the chart. The animal was irradiated on the 10th of August with the dose used in the first animal. There was at first an increase in the amount of sugar excreted; this was followed by a period of three weeks which were sugar free except for a few days when some sugar was noted. After this time the diet was increased at first 75, later 100 gm. of dextrose being added. Irradiation at this time was followed by a distinct lowering of the sugar tolerance (Sept. 22) which was made even more apparent after a third irradiation on the 29th of the month. The experiment makes evident the fact that a moderate dose may at first be followed by evidence of increased tolerance and no injury to the pancreatic function, while repeated doses (cumulative effect) give evidence of pancreatic injury and lowering of tolerance.

In general we may state that our experiments have shown that with moderate doses of roentgen rays applied over areas containing pancreatic rests there may result: First, an augmentation of the sugar excretion, which we assume is due to the general tissue stimulation and is comparable to the effect in diabetic patients of a variety of procedures, protein therapy, intercurrent infection, adrenalin injection, etc. Second, this effect is frequently followed by evidence of pancreatic stimulation with increased sugar tolerance, in some instances reaching a maximum in about three days after the irradiation, in others evidently persisting for some time (three weeks) after the treatment. Third, if the dose is too large or if a cumulative effect is produced there results lowering of sugar tolerance, indicating injury to the pancreas.

In passing we would call attention to the fact that the conditions for successful experiments of this type are much more favorable in the dog than in the human case of diabetes. The pancreas are nearer the surface, the skin of the dog is relatively resistant to irradiation and the pancreatic rest represents relatively normal tissue, which may react in a more favorable manner than pancreatic tissue already pathologically altered.

However, even in clinical cases there is some evidence that with proper apparatus a diabetic process may be influenced by direct irradiation; the paper of Stephan is of particular importance in this connection and I hope that we may soon have his evidence confirmed in clinical cases from roentgen laboratories equipped with high voltage apparatus.

We have mentioned another possibility, namely the effect of irradiation on remote pathological processes when some organ complex is exposed. It is, of course, well known that following the irradiation of the abdominal viscera, cell-rich neoplasms, goiters, etc., a general systemic reaction takes place, ranging from a transient malaise to profound intoxications and shock pictures and even death. Such effects must be due to substances (protein split pro-

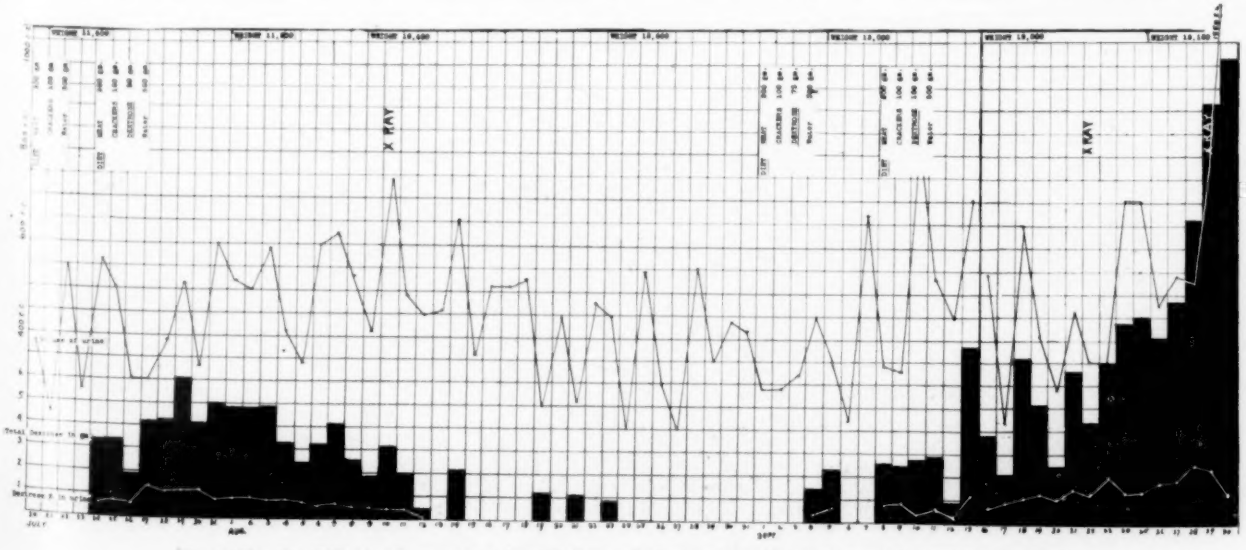

Chart No. 2. Effect of roentgen irradiation of the pancreatic rest on the sugar tolerance

ducts, enzymes, cellular detritus, etc.), that enter the blood stream from the organ rayed. So, too, it is known that a focal activation of chronic inflammatory foci takes place after remote irradiation, as for instance in arthritis, lupus, furunculosis, etc. This phenomenon must also be due to substances carried through the blood stream.

We have, therefore, examined the differences that may be determined in the serum when different organ groups are rayed for different time periods. In this work we selected the hepatic, the splenic and the lower abdominal region, realizing, of course, that in no instance would we be getting effects of actually isolated organ raying because of the simultaneous effect on neighboring tissue. Inasmuch as the details of these experiments have been published, we wish at this time merely to point out the general character of the observations.

It was found that the leucocytosis that followed such regional irradiation varied. Irradiation of the hepatic area resulted in a sharp but transient rise; of the intestinal area in a step-like increase in the number of leucocytes; of the splenic area in the frequently observed diminution of the white count. Coagulation changes followed after irradiation of all the areas exposed [4]. Enzyme alterations were noted to be most marked after irradiation of the hepatic and intestinal areas; the splenic irradiation was least effective in this connection. These alterations may have some significance in the phenomena to which we referred, namely roentgen intoxication and the focal activation by remote irradiation.

In conclusion, I should merely like to point out once more the two possibilities of approach to therapeusis by this means. We have first of all the direct method whereby a hypofunctioning or dysfunctioning organ is stimulated to increased function. The experimental evidence that we have presented for the kidney and the pancreas would make this method one to be considered in certain cases of nephritis and of diabetes. While we would not at this time suggest the clinical application of the method in the diabetic amenable to dietetic treatment until more knowledge has been gained with experimental work on animals, it might perhaps be warranted in diabetic coma where other methods have failed. The same is true of kidney conditions.

The second method is an indirect one, and takes into consideration the fact that the roentgen shock is akin to protein shock and has, therefore, a certain *a priori* basis for therapeutic effects [15]. There is, furthermore, the possibility that by stimulating certain normal organs we can throw substances into the circulation which may have an effect on remote disease processes. We believe that roentgenotherapy along these lines may have a considerable field of usefulness not heretofore developed.

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Status of the Radiologist in Small Communities*

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THIS short paper was written under the impression that others should know the quandaries in which the serious radiologist, far from his colleagues in the same specialty, often finds himself. He must be everything from a technician to a diplomat, and one false diagnosis in a small town may cost him his practice. Even though he may be so fortunate as to possess a good technician he must still do much of that part of the work himself. Often the doctors in his territory are loath to send their patients for diagnosis, fearing that their own reputations may suffer thereby, and so with rare tact the radiologist must explain to the patient that it is only to confirm the diagnosis of the general practitioner that his art has been called upon. Above all, must he come to his community well equipped with medical and especially surgical knowledge. He must be well versed in gross and microscopic pathology and not think that all he has to do is to buy a good transformer and some milligrams of radium to insure success, and he must keep in mind that x-ray or radium is not a panacea. Only through repeated lecturing and reading of papers before the small medical societies and even to lay audiences will he be able to open the door to deserved recognition of his specialty.

The consulting radiologist is a specialist and I am glad to say that after a number of years of work, two of which have been in the service, I have arrived at that position. To me a 'real radiologist is a consulting physician who adds to his instruments of diagnosis a knowledge of roentgenology, and to his general therapy adds that of x-ray, radium or fulguration. He must be imbued with confidence in the power of, and inspired with the love of, his profession, for only this will spur him on to keep abreast of the times and to seek advice from his colleagues of the larger centers, and especially from the pioneers in the work. So will he open up the path into the community which he has chosen as his and make it a center of good work to which his colleagues will send their patients because they trust the probity and the skill of the radiologist, and to which the patients will unhesitatingly come for like reasons.

All this will not come without time and patience. How many times have I been asked to extract some foreign body under the fluoroscope with the doctor who brought the patient in, acting as assistant surgeon! How many times have I had to explain to some doctor, without giving offense, that the appointment for a gastro-intestinal examination must be left to me, and the patient not sent for an examination between trains! Many physicians still think that the diagnosis of tuberculosis can be read from the plate as from a magic book. Here we must make it clear that accurate and sufficient clinical findings must be given us before our branch of science can render aid. Many doctors come to us and consume our time in showing them the plates and explaining to them a lot of things which they do not know, after which they go back to their patient and tell him they have seen the plates and read them!

Many patients come to us in fear and trembling asking if it "is going to burn much." I have learned in one of our great western clinics the secret, in part, of its success. The patients are allowed to mingle and talk with one another, even sometimes assisting in fluoroscopic examination. Thus they learn that there is no magic behind the doors and they gain an intelligent, if limited, understanding of, and a respect for, and confidence in, the profession of the radiologist. Besides this, the realization that the next one may be worse off than he himself is often has a good psychological effect upon the patient. Such an atmosphere accompanied by smiles and kindness, and yet with firmness, will add immensely to your personality, and though the patient may not go away cured, he will go convinced that everything within the power of present day science has been exerted for his benefit.

Not only must the radiologist be capable, thorough and careful, but he must guard his integrity and his reputation jealously and wisely. What will you say to the patient sent to you for radium treatment after a Halsted operation if you do not yourself examine her completely? I will show you among my slides such a patient sent to me. After examination I refused to treat her unless the husband was told of her condition so that he would not afterward think that we had not done all we could and feel that he had spent his money for nothing. I would not give her so many hours of radium and then send her home with false hope. That is not our duty, as I see it, and we must not allow ourselves to be told by some surgeon what to do in order that he may, excuse the expression, pass the buck.

*—Read at the Annual Meeting of The Radiological Society of North America, Chicago, Dec., 1921.

EDITORIAL

The JOURNAL OF RADIOLOGY

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The Future of Medicine

MOST medical men are fatalists, whether they admit or deny it. The fact is, they see so much of the effects of social and individual degeneracy in its ramified forms that they accept the conditions as they find them in a detached and disinterested fashion. It couldn't possibly be otherwise, because if the busy medical practitioner were to let every case of physical suffering or mental anguish produce its counter-effects on his emotions and passions, he would, within the first busy fortnight, become a physical and mental derelict—a maniac in a padded cell to prevent him beating out his own brains.

MEDICINE AND FATALISM

Certainly this condition presents a neurosis that is not going to be overcome by taking a pink pill or even a compound cathartic. The affliction does not involve the intestinal tract. It is a question for the neuro-psychiatrist. And he will find it a difficult, if not an impossible, job to determine those issues which involve the nature of the man, the effects of the social sphere in which he moves, the scope of the purposes of the individual and their relation to the social purposes which inhibit, distort and encourage the professional ego.

Man is neither aggressive nor creatively purposive when he is physically and mentally exhausted. So it is no wonder that the busy medical practitioner, who eats when he can, sleeps when he must, and spreads merry sunshine when his heart is skipping and his soul is sodden, finds neither the time nor the inclination to erect for himself and his fellowmen a philosophy of life. At best, his is a perfunctory existence, with the daily grist of bellyaches and hysteria, demanding a pill here and a bit of good advice there, till his troubled mind becomes case-hardened and finds comfort in the belief that whatever is to be, will be, and it may as well be now so as not to prolong the agony.

But however much the medical man as such may revolt at the thought of being held responsible for the prevention as well as the cure of those physical and mental ailments whose familiarity has already filled his heart with contempt, that is precisely the thing being demanded of him—a job which hangs over his head like the sword of Damocles ready to fall if he refuses this socio-scientific function or whether he accepts it and fails ignominously in achieving something no other human being has ever been able to achieve.

MEDICAL SOCIOLOGY

Stated succinctly, the facts which constitute the present dilemma of medical science, are:

1. Individual health and happiness are both cause and effect in the social health and happiness, wherefore medical science is compelled to admit its ministrations can never be made fully purposive until that science embraces and directs man's social habits, relations and contacts.

2. Sociology and psychology are just as important as biology in any rational and intelligent effort to accomplish preventive and curative medicine.

3. So far as practical medicine is concerned, speaking now both preventively and curatively, the individual, physically and mentally, must be studied as a complete functioning organism if the utmost in health, happiness and usefulness is ever to be either approached or achieved.

In support of this view, it is our honor and pleasure to quote from a personal letter written by Dr. Abraham Myerson, Assistant Professor of Neurology, Tuft's College Medical School, Boston:

DR. ABRAHAM MYERSON

"(1) I conceive that the highest goal of human effort is the development of the human personality in efficiency, happiness and dignity. Other results of culture and social effort seem to me to be secondary. I, therefore, believe that medical science, in endeavoring to bring about this social aim, must ever keep in mind that the human being is not divisible in two parts, a physical and psychic, but must stress that all the physical conditions of living which hurt the human being in any way hurt his personality; that bad housing, slums, preventable disease, under-nutrition, overwork, etc., are not only detrimental to what is ordinarily called health, but detrimental as well to personality."

"(2) Medical science, of course, must go much further than this. It must insist that the emotions, the purposes, and the intelligence of man are socially determined as well as biologically determined. It must, therefore, look with a candid eye into the purposes of society and into the traditions, culture and ethics of the various groups of society, and endeavor to determine how much of this is rational and in accordance with what we really know about the human being, and how much of it is dead weight and an impediment handed down from our own unenlightened ancestors. We may conceive that a man struggling against wrong ideals, traditional purposes, and ancient ethics may injure his body and may injure his mind, and in view of these injuries our science is called in as a consultant. I feel very strongly with Freud that a scheme of society has to be organized in accordance with the nature of man, though I differ with him in my conception of what that nature is."

"(3) It thus comes about that medicine as a socio-scientific unit leaves its swaddling clothes of the care of the individual in accordance with materia medica and therapeutics and steps into a much bigger role. It brings its knowledge to bear on the fields of public sanitation, on the fields of social reform and social legislation, on the fields of ethics and education; in a word, on the culture of the world in which it operates. As a neuro-psychiatrist, I am compelled to answer questions every day which must take into account the nature of man, the nature of society, the individual purposes, and the social purposes, and I believe that medicine as a whole must become the great consultant and director in all the other fields of human activity."

"Foundations of Personality"

ANY serious effort to prescribe the sphere of influence of medical science in the social welfare leads back immediately to questions involving the nature and functions of the individual. That there is some causal connection between those conditions one sees in the social body every day and the traditions, habits, and environments by which men formulate their conduct, there isn't any doubt. That these same facts also spell the job the science of medicine must assume cannot be denied. And notwithstanding the blight of mental inertia which is the inevitable consequence of a fatalistic proclivity, here and there occasionally one finds in the medical profession an active mind trying to set its house in order and project itself into the future of medical science.

WHAT IS MEDICINE?

Such an one is Dr. Abraham Myerson, of Boston, whose latest book on the "Foundations of Personality" is the most rational, lucid, and serious presentation of individual and mental co-ordination, expression and control found in the literature of modern medicine.

Starting from the premise "that the mind is the function of the organism * * * that the body is a living thing and as such *is as spiritualistic* as life itself; that enzymes, internal secretions, nervous activities are the products of cells whose powers are indeed drawn from the ocean of life"—a cardinal principle which the author substantiates by scientific and facts of common knowledge showing, first, dependence upon proper brain function and structure, and second, dependence on proper health of the other organs, Dr. Myerson analyzes the human body as a functioning organism, physiologically and psychologically, and strips the thing called personality of all the mysticism and mystery so shamefully prevalent because of sheer ignorance and theological teaching.

Three quotations, the first taken from the chapter entitled "Intelligence and Will," at page 115, the second and third from the chapter discussing "The Sentiments of Love and Hate" at pages 161 and 163 respectively, will serve to show the serious way in which the author proceeds in the development of his subject:

> "* * * Intelligence deals with the relations between things * * * and intelligence only becomes intellect when it is able to see the world from the standpoint of abstract ideas, such as truth, beauty, love, honor, goodness, evil, justice, race, individual, etc."
>
> "In passing, an interesting development of our times is worth noticing. The tendency is to discard established codes, to weaken dogma, and to throw more responsibility on the individual conscience."
>
> "In the end, the true sense of duty is in a sense of individual responsibility. Our age feels this as no other age has felt it. Other ages have placed responsibility on the church, on God, and on the state. Difficult and onerous as is the burden, we are commencing to place duty on the individual, and in that respect we are not in the least a decadent generation."

Surely here is an undercurrent of social theory and practice that is of vital concern to medical science. With all the world demanding a high degree of individual intelligence and responsibility, there is bound to develop an even greater ratio of demand in this respect upon the man of science who professes to know how men should conduct themselves and why that conduct should conform to certain standards.

The tremendous range of medical contact with the question of human actions and reactions with their concomitant effects on the individual health is undoubtedly responsible, at bottom, for the spirit of specialization in the medical profession. Dr. Myerson illustrates this situation in a very naive manner when he says on page 194, under the chapter heading "Energy Release and the Emotions."

> "You may know a man (or woman) not by his lip-homage, but by what he genuinely admires, by that which evokes his real enthusiasm and praise. Judge by that and then note that the most constant admiration of the women of our country goes out to actresses, actors, professional beauties, with popular authors and lectures a bad second, and that of the men is evoked by prize-fighters, ball players, and the rich. No wonder the problems of the world find no solution, for it is only by fits and starts that men and women admire real intelligence and real ability. The orator has more admirers than the thinker, and this is the curse of politics; the executive has more admirers than the research worker, and this is the bane of industry; the entertainer is more admired than the educator, and that is why Charlie Chaplin makes a million a year and President Eliot received only a few thousand."

And again, on pages 195 and 196 of the same chapter when he touches the other extreme in the dominating forces of human conduct:

> "Though the reverent spirit is admirable and poetic, it is not by itself socially valuable. It has been played upon by every false prophet, every enslaving institution. It prevents free inquiry; it says to science, 'Do not inquire here. They who believe do not investigate. This is too holy a place for you.' We who believe in science deny that anything can be so holy that it can be cheapened by light, and we believe that face to face with the essential mysteries of life itself even the most assiduous and matter-of-fact must feel awe. Man, the little, has probed into the secrets of the universe of which he is a part. What he has learned, what he can learn, make him bow his head with a reverence no worshiper of dogmatic mysteries can ever feel."

There is but one place in the entire book where the author seems to have relapsed from the keenly analytical and intellectually prescient method which is so pronounced in all the remaining pages. That is to say, if one is to carry over the abstract principle first quoted, that is, "Intelligence deals with the relations between things * * * and intelligence only becomes intellect when it is able to see the world from the standpoint of abstract ideas, such as truth, beauty, love, honor, goodness, evil, justice, race, individual, etc.", and use it as a test in dissecting the following statement, found on page 234 under the chapter heading "The Evolution of Character," there seems to be a maverick in the lot not heretofore present:

A CLASH OF PRINCIPLES

> "The world is built upon the sacrifices of the idealists, and eternally it crucifies them. Wealth and power are to him who has a marketable commodity, and one cannot complain when true genius becomes rich. But the genius to make money may be and often is—an exploiting type of ability, a selfishly practical industry which neither invents nor is a great service. The men who do the basic work in invention and scientific work in laboratories are poorly paid and only now and then honored. Every year in the United States, hundreds of them leave their work in research and seek paying jobs; to the impoverishment of the world, but to their own financial benefit. Countries where the scramble for wealth is not so keen, where the best brains do not find themselves pressed into business, produce far more science, art, and literature than we do, with all our wealth. We will continue to be a second-rate nation in these regards, still looking for our great American novel and play, still seeking real singers and

artists, until our idealism can withstand the pressure of our practical civilization."

There can be, of course, no serious denial of the facts on which Dr. Myerson builds his conclusion. But looking at the whole problem in an abstract way—an impartial way—one is inclined to ask whether the greater part of the scientific work of the world has not been entirely unattached, and to offer the suggestion that this utter lack of co-ordination of effort and correlation of achievement has rendered the product of scientific labor largely invaluable in and of itself. And by the same token, laborers in the scientific realm cannot complain if they find no real market for their services until they do for themselves what they profess to do for others. It would indeed be a strange anomaly if those men and women of science who claim to know how to devise human health and happiness for others cannot demonstrate their ability in this respect in their own work and lives. And in this connection, the statement is made without fear of successful contradiction, that the greatest weakness that science in all its phases must overcome is the utter lack of organized effort according to some common plan which will not in any way restrict, but on the contrary, will enlarge the possibilities of, and give direction and purpose to, the labors of all scientific men.

Any other conclusion is hardly tenable in view of the social contacts of medical science. Dr. Myerson aptly epitomizes the problem which is causing such a stir in the field of science when he says, on page 269 in discussing "The Methods of Purpose":

> "As the factory system develops, as 'efficiency' removes more and more of the interest in the task, social unrest will correspondingly increase. One of the great problems of society is this:
>
> > "How are we to maintain or increase production and still maintain the love of work? To solve this problem will take more than the efficiency expert, who works in the interest of production alone; it will take the type of expert who seeks to increase human happiness."

This very naturally involves the science of medicine, as well as all science, because it may be accepted as a truism not requiring demonstration here, that human happiness is not attainable to the fullest extent except as it is founded on physical health and mental stability and purpose.

There are a lot of other important and interesting features developed by Dr. Myerson. But it is impossible to cover all of them in this discussion. Some of the most significant thoughts have been picked out and considered briefly. On the whole the book is one whose thoughtful study should prove valuable to every member of the medical profession and be kept in the library for constant reference. It can be procured from the publishers, Messrs. Little, Brown and Company of Boston.

Scientific Research and the Radiologist

IF one were truthfully to answer the question, "What has been the single greatest force in the advancement of medical science?" he would, obviously, be compelled to say "scientific research."

SCIENTIFIC RESEARCH

If one were equally candid in answering the question "What single agency contains the greatest promise for the future development of medical science?" he would be obliged to say "scientific research."

And if, perchance, one should exhibit sufficient temerity to ask the same questions and demand like answers concerning the science of radiology—a branch of medicine—he would still be confronted with "scientific research."

Perhaps these questions seem unnecessary and silly. But when one goes deeply enough into the matter to set up the facts concerning the conduct and plan of scientific research in medicine, and particularly in the field of radiology, he runs head-on into two things, first, that there is neither co-ordination of effort nor correlation of labor, and second, that, generally speaking, those persons most vitally interested in the science, especially radiologists, have done, and are now doing, absolutely nothing to foster consistent, continuous, and exhaustive research for the purpose of extending the field of operability and definite applicability of its curative and preventive powers wherever there is human suffering and the question of health is involved.

There are, of course, many institutions and individuals working out specific isolated problems. Medical colleges and other institutions of higher learning are struggling along as best they can with limited funds and without any particular encouragement. A few individuals, comparatively speaking, are trying to carry a back-breaking burden and give to their profession absolute data which will enable others to relieve and prevent human distress. But for the most part, these men are working alone, driven beyond their capacity because of the great possibilities they see in scientific achievement, and assailed constantly and everlastingly by the realization that single-handed it is impossible to turn back the flood of human suffering and give men those facts on which they can base a practical knowledge of life. There are, also, other institutions endowed by philanthropic men with what seem almost fabulous sums until one looks at the job from the inside-out, and not from the outside-in.

But over and above the question of funds, there is a profound problem—the absolute necessity for a universal interest in and active support of scientific research. This is a condition precedent to anything like co-ordinated effort according to some preconceived and correlated plan, because the research worker must be, and is, constituted very differently, mentally and environmentally, than is the ordinary medical practitioner, whether that term be used in the broad sense or applied to some specific specialty.

As a proper beginning, it must be recognized that scientific research is the work of individuals. As it must, also, be recognized that if those individuals are ever to do anything worth while, viewed from the angle of large social service, they must be sustained and supported by those for whose benefit they labor.

BURDEN BEARERS

And in order that their labors shall be made as effective as possible, they should have constant contact with, and receive suggestions from, men engaged in the practical application of the science to humanitarian service under all sorts of conditions in all phases of society.

As it is now, a few men are doing research work, some with very limited funds, which they are able to secure from philanthropic sources, and others are attempting to serve two masters by trying to divide their energies between a practice which provides a living and scientific exploration which makes living worth while. The result is that he is more than an extraordinary man—indeed, he is a very rare bird—who can apply himself successfully and fruitfully in consistent laboratory work year after year, and at the same time conduct a professional practice to discharge his obligations decently and honestly to himself, his family and society.

So much for this phase of the subject.

The natural questions that now demand very serious and prolonged consideration are, how are these conditions to be overcome? What is the duty of the medical man? What is the responsibility of the radiologist?

These are tremendous problems. The sheer magnitude of their scope will frighten a great many men and they will wander off into specious diatribes about the traditions of the profession, about ethics, and numerous other things which

do not involve the enormous responsibility inherently bound up in this sort of a constructive program.

However, the more thoughtful and courageous will observe a few facts which indicate the place of beginning, a few opportunities which hold out possibilities of large and beneficial research.

First: There are numerous medical organizations which should foster and financially support scientific research.

Second: There are already many institutions and laboratories which would be willing to undertake work of this character under the direction of the medical profession if funds for that purpose were made available.

A FEW FACTS

Third: There are many individuals capable of performing various functions in a co-ordinated and correlated program of this sort if directed and financed either on a full-time or part-time basis.

Fourth: There is already in existence a wealth of data of one kind and another touching the social as well as the strictly medical phases of the public health.

Fifth: The problem is not one of providing an eternal social solvent, because any thoughtful person will realize there is, there can be, no such thing. Rather it is a question of method purely. Through scientific research the working tools can be provided whereby the medical profession, and the radiological profession, can with some degree of assurance meet the constantly shifting problems of their daily practice. By the establishment of certain definite and absolute principles and the building up of machinery for the intelligent assembly of facts, there will be set in motion methods of precision which will be capable of attacking seriously any condition, due respect being had, of course, for the essential element of time.

With these very definite and tangible factors as the basic element of their research activities the Radiologists, who are primarily medical men, and The Radiological Society of North America, which has assumed the initiative in this important field of scientific advancement, more particularly as it relates to the science of radiology, can, if they will, accomplish incalculable results—results which will dignify their profession by greatly enlarging its possibilities in therapeutic work.

WHAT IT MEANS

So that, no matter whether one looks at this job from the high professional level of a scientific obligation met and fulfilled, or from the purely personal plane of self-interest, he cannot help finding sufficient justification for his unqualified support of the undertaking. It is not, in any sense of the word, another charitable donation added to the already overwhelming list. It is an investment even more certain of returns than schooling and laboratory and office equipment.

The May Meeting

THE attention of radiologists is again called to the fact that the mid-year meeting of The Radiological Society will be held at the Planters Hotel, St. Louis, on May 19th and 20th. Hotel reservations should be made at once directly with the hotel. It is suggested, however, that if later you find it impossible to be present, your cancellations should be sent to Dr. E. C. Ernst, Humboldt Building, St. Louis. By so doing, you will enable him to take care of unexpected reservations coming in at a later hour.

Special railroad rates have been arranged on the certificate plan. When you buy your ticket ask the agent for a certificate. The announcement of the reduced rates has been made conjointly with the meetings of the American Medical Association, The Radiological Society of North America, and allied organizations. It will be necessary for you to mention this fact to the ticket agent so that you may have the opportunity of taking advantage of the early selling dates which are necessary if you wish to attend the meeting of The Radiological Society. No matter if you are coming only a distance of fifty miles, ask for the certificate just the same. At previous meetings a number of men who came short distances thought it would not pay them to bother with the certificate. As far as their own personal saving was concerned on such a short distance the saving was very small, but these certificates are issued on the basis of selling a certain number, and if that number falls short through the thoughtlessness of those coming a short distance, it works a very great hardship on those men coming from a great distance.

These certificates must be turned in at the registration desk when you first come, as they will have to be validated and returned to you later. Please bear these details in mind and act accordingly and promptly.

Preliminary Program

THE following constitute the original scientific theses which will be presented at the May meeting of The Radiological Society in St. Louis. This is a preliminary program announcement. The complete program will appear in the May issue of The Journal.

"The Effect of X-Ray on Cell Division"—Jas. W. Mavor, Ph. D., Schenectady, N. Y.

"Does Radiation Enhance Post-Operative Recurrence of Carcinoma of the Breast"—M. J. Sittenfield, M. D., New York City.

"Present Status of Radiation Therapy with Case Reports"—J. Thompson Stevens, M. D., Montclair, N. J.

"An Estimate of the Value of Perirenal Emphysema in Diagnosis"—L. T. Le Wald, M. D., New York City.

"Combined Radium and Diathermy"—C. W. Hanford, M. D., Chicago, Ill.

"Treatment of Uterine Fibroids with Slides Showing Original Appliances"—James N. McCoy, M. D., Vincennes, Ind.

"The Determination of the Intensity of X-Rays of High Voltage"—Henry Schmitz, M. D., Chicago, Ill.

"The Inheritability of Spontaneous Cancer in Mice and Its Application to Man"—Maud Slye, M. D., Chicago, Ill.

"The Etiology and Pathology of Cancer"—L. Loeb, M. D., St. Louis, Mo.

"Radiotherapy in Carcinoma of the Larynx with Special Reference to Needling Through the Thyroid Membrane"—Geo. E. Pfahler, M. D., Philadelphia, Pa.

"Protecting Patients from the High Voltage Line"—Albert Soiland, M. D., Los Angeles, Calif.

London Congress

WE are informed by Dr. A. E. Barclay, of Manchester, England, that there will be a congress on radiology held in London, June 7th to 10th. A very cordial invitation is extended to any members of The Radiological Society or radiologists from America who are not members of the society to attend this congress.

The doctor remarks that the congresses in England are not quite so strenuous as those which he attended while in America, and that the men there give more attention to the social side of the meeting, feeling that they obtain as much, if not more value from meeting people away from the set discussions than in the actual meetings themselves. This remark shows the spirit of the men and we hope that any one who is in England at the time or who is planning a trip abroad can so arrange his itinerary that he may be present at the congress mentioned.

Research Bureau

IT will be recalled by the members of The Radiological Society who attended the last annual meeting that during the year 1921 President Williams appointed what was called a committee on research. The personnel of this committee was as follows: Carl Ballard, M. D., Omaha, Nebraska; Thomas A. Burcham, M. D., Des Moines, Iowa; Fred S. O'Hara, M. D., Springfield, Illinois; Albert F. Tyler, M. D., Omaha, Nebraska.

This committee was appointed for the purpose of carrying on certain investigations relative to the best manner of co-operating in research already under way in America, and, if necessary, planning for research on certain specific problems about which the members of The Radiological Society might be concerned.

During the latter part of the year 1921 the situation was investigated and a report of the committee was given at one of the executive sessions of the last annual meeting as follows: "Your committee would recommend first the establishment of a department of research by The Radiological Society; second, that the president appoint a committee empowered to work out the details for proper functioning of this department." The report was accepted and the committee continued for another year with the personnel unchanged. It was suggested that the committee continue its work during the year 1922, aiming, if possible, to lay out a definite plan of operation to be followed by the society in establishing a research department or bureau.

The committee is now working on a plan which ought to show some results in the near future. As fast as the plan becomes definitely formulated we shall be glad to publish further information.

Licensing Technicians

THE remarkable growth of the field of radiology has required the services of a large number of specialists in the use of roentgen rays and radium to diagnose and treat disease. Creation of local, sectional and national societies has about completed the pioneer labor of workers in all parts of the country, so we have now available the ordinary contacts with fellow-workers and the older and broader scientific bodies. There is necessary still greater development of these organizations. Scientific research, standardization of technique, a uniform language, and recognition of high ideals are different phases that must go on as progress is made.

Until recently the technicians have not received any special attention. They have been looked upon as individuals selected to carry out the routine labor about the laboratory. They have been trained according to the particular job offered. By far the greater number have come from the ranks of the nursing profession. Many have been bright office girls made over from the ranks. Some, like Topsy, "just growed." There are a few male technicians who are employed. A place exists for them in certain larger clinics and in some lines of the specialty.

Certain evils have grown up, due to this haphazard development of the technical field. All agree that the greatest harm is being done by the technician who on his own responsibility, or under the guise of reputable protection, conducts a laboratory, giving opinions and advice in diagnosis and treatment. A few women are doing this, but by far the greatest number of offenders are male technicians. In some states they are asking for legal recognition, and have received special protection from the full enforcement of the medical practice act, just as osteopaths, Christian Scientists, and other irregular practitioners have done.

This is not the only evil that has arisen. The next one is an injustice to the honest, square technician. It is the complete disregard of the technician, his rights and his perquisites. On first thought the need of standardization and high ideals among technicians may not be great, but sober reflection brings the inevitable conclusion that more attention to the technicians will elevate this class of skilled workers and promote the right ideals. If there are standards for selection and standards in training and experience, there will grow up a capable body of assistants valuable to any radiologist. "The workman is worthy of his hire." Technicians exist, they carry heavy responsibilities, and they associate daily with the radiologist.

For over a year a commission appointed by The Radiological Society of North America has been studying this problem. They have had advice from every part of the country. They have acquainted themselves with the needs of clinics, hospitals and private hospitals. Often they have found conditions very different where situations are dissimilar. Conclusions generally applicable have crystallized out. At the last annual meeting in Chicago the Society definitely decided to establish a board to license and control technicians and to set up certain standards for selection and procedure. This movement has been launched. In a short time it is hoped that the actual work of the board will have begun.

There is agreement on some of the standards to be used in selecting candidates. For instance, it is agreed that the most desirable technician is a woman, and that she should be a trained nurse. A technician must not diagnose orally or in writing, nor treat on individual responsibility, nor practice in an office separate from a duly licensed doctor or dentist, and must always be under direct medical or dental supervision.

The following recommendations have been adopted for the certification and control of ethical roentgen technicians. The Board will be glad to receive any helpful suggestions and advice. Already letters are being received from training schools asking for requirements so that their nurses may be graduated into preparation for roentgen technicians.

Recommendations for Certification and Control of Ethical Roentgen Technicians

1. A board of five shall be appointed by the president of The Radiological Society of North America, consisting of three roentgenologists, members of this society, one physician and surgeon recommend by the American Medical Association, and one technician of reputation and standing.

The members of this board each will serve three years, a new member being appointed each year.

The purpose of this board will be to examine and control acceptable technicians seeking certification as to their ability to practice as assistant to any reputable physician, surgeon or dentist.

This board shall formulate its own rules and regulations, in so far as they do not conflict with the recommendation now being made. It is the purpose of these resolutions to give wide latitude in the control of technicians and revocation of recognition when the board sees fit.

2. The applicants for certification shall be twenty-one years old, male or female. They shall have the equivalent of a high school education and that of a trained nurse. The board shall determine the meaning of the word "equivalent." They shall have served at least two years with some reputable physician or institution.

3. Examination shall be made possible for any technician applying who has furnished proper credentials. It shall consist of written and oral demonstration covering physics, equipment, dark-room service, anatomy, technique and experience.

4. A certificate shall be issued to those who demonstrate sufficient knowledge and experience. This certificate shall be good only so long as the owner is under the direct

supervision of some reputable physician, surgeon or dentist, and not in an independent office.

5. In the main we endorse the constitution of the American Association of Radiological Technicians.

6. It is hoped that co-operation can be obtained between this Society, the American Roentgen Ray Society, and the Canadian Roentgen Ray Society. To this end the board shall carry on negotiations with them, seeking to consummate this co-operation by the next annual meeting.

7. All legal matters or efforts to repress the lay x-ray laboratory which might arise in the work of this board shall be referred to the Committee on Frauds and Practice.

8. Power is given to endorse and recognize training schools and roentgenologists whose standards satisfy the board, and also to revoke the same for cause.

AMENDMENTS

(a) The three appointees from The Radiological Society shall serve for three years. The appointee from the American Medical Association shall serve three years, and from the Technician's Association three years.

(b) Definition of Nurse: A graduate of a recognized school, and registered in the state.

E. W. R.

Radium Insurance

NOTICE was recently received from Lloyd's insurance agency of London that hereafter the rate of complete coverage insurance on radium would be five per cent. This is two and one-half times the rate previously charged and means that one is paying one-twentieth of the value of the radium annually for insurance. This raise in rates probably means that losses of radium have been so frequent that the lower rate was unprofitable to the insuror.

There are doubtless several factors entering into the frequent losses of radium. One is the fact that the insurance was for full value, which meant that if the radium was lost the only real suffering on the part of the owner was the inconvenience of being compelled to help make a search for it and the lack of income from its use during the interim elapsing before it could be replaced. The psychology created in the owner by this condition led to less care in handling than would otherwise be the case.

Out of three losses in this immediate vicinity two were in hospitals and one in an office. In both losses in hospitals, nurses removed the radium with dressings, the whole mass going into the incinerator before the loss was discovered. When analyzed, this kind of a loss means that the nurses having charge of the radium were not fully instructed about its value and use. We feel that this kind of loss could be prevented by either forbidding the removal of radium by nurses or by more careful instruction to them. Another means of preventing this kind of loss would be to fasten to the radium a large metal tag painted red and labeled in some manner similar to the following: RADIUM, DO NOT REMOVE.

The third loss occurred in an office, the radium apparently having slipped from under the dressings, for it was not present when they were removed. So far as we are informed this radium was never recovered. This kind of loss is due purely to carelessness in applying the radium to the patient, combined with allowing the patient too much liberty during the treatment. This much, then, for the responsibility of the careless owner who brings about the large percentage of losses, and in this manner compels the careful man to pay for his carelessness.

Let us now look at the insurance situation as it exists today. So far as we are informed, London Lloyd's and the Automobile Insurance Company of Hartford, Connecticut, are the only companies offering insurance on radium. A recent communication from one of the local representatives of the Automobile Insurance Company, shows the following limiting clause a part of the policy contract:

> "No claim to attach hereto for loss while any radium insured hereunder is used on or about patients unless such patients at the time of loss are under the exclusive care of a registered or hospital nurse, medical doctor, and, or, his assistant to the exclusion of other patients."

A representative of the Insurance Company offers the following interpretation of the limiting clause quoted:

> "By medical doctors' assistants we mean those who are taking the prescribed and recognized course to fit themselves for the medical profession. In other words, those students known to hospitals as internes."
>
> "By registered nurse we mean those who have taken the prescribed and recognized courses in hospitals to fit themselves to be trained nurses."
>
> "By hospital nurses, we mean those who are taking the prescribed and recognized courses in hospitals to be trained nurses."
>
> "Practical nurses, unless they have taken the prescribed courses, or orderlies, are not sufficient under the policy."

Defining the term "assistant," this agent adds:

> "An assistant to the medical doctor may be any one he may elect. It should be clearly understood, however, that the person so designated by the doctor is to be one who is capable of being recognized as an assistant insofar as his or her knowledge of the element is concerned and ability to properly handle or supervise the patients undergoing treatment. *In other words, the person elected by the doctor must be familiar with the uses of radium, and have no other patients to care for or no other duties to perform during such time as the radium is applied to the patient.*"

Particular notice should be given to the italicized words.

To illustrate: If two patients were sitting in a doctor's office with radium applied at the same time, it would be necessary to have either two doctors or two registered nurses in constant attendance to meet the terms of the policy. For each additional patient another doctor or another nurse must be provided. On the other hand, if a patient is being treated at a hospital, a trained nurse must be in constant attendance during the treatment time. For each additional patient an additional trained nurse is made necessary.

We are not sure but what two nurses would be necessary, one for night and one for day. We hope to have an interpretation of this point soon. You can readily see that where one nurse is required for each patient it means an added expense of not less than nine dollars per day, six dollars wage and three dollars for meals. If two nurses, one for day and one for night, are required, it would mean eighteen dollars per day, which interpreted in terms of the usual three day application of radium would cost the patient seventy-two dollars for nurses besides the hospital bill. We doubt whether such a program could be put on with the patient of average means. This requirement would practically stop all use of radium on charity patients because they would not pay the nurse and the hospital would not furnish one.

Taking into consideration the "limiting clause" and its interpretation by the insurance company representative, the policy is really of little value to the owner of radium.

It would seem from consideration of the above statements that there are three possibilities of relief from this situation. First, that the Automobile Insurance Company voluntarily change the wording of its "limiting clause," leaving out the word "exclusive," so that one nurse or one physician may supervise more than one patient at one time. Second,

that the Automobile Insurance Company issue a policy with a three-fourths loss coverage clause. This would enable the company to write such insurance at a reduced premium, since they would not bear the whole loss, the owner assuming a certain portion of it. Third, the formation of a mutual insurance company, the stockholders consisting of owners of radium.

It appears to us that the second plan would be the best if it can be carried out. There are several arguments in its favor. The fact that a well established, financially sound insurance company is back of the policy would be the greatest argument. We believe, however, that where the owner is compelled to assume a portion of the loss that carelessness would be largely eliminated, which would in turn react favorably on both the insuror and the insured.

Dr. George E. Pfahler of Philadelphia, president of the American Radium Society, has already sent out a questionnaire to all members of that society soliciting an expression of opinion from them. We shall hope to have additional information about this question in the future. Suggestions will be gladly received.

Deep Therapy

ONE of the outstanding features of the Chicago meeting of The Radiological Society was the intense interest in the subject of deep therapy shown by such a large majority of the attendants. This was reflected in a large measure by the fact that no less than seven different types of the newer high voltage instruments were exhibited by manufacturers. This is of singular significance in that it shows with what rapidity our specialized medical group is taking advantage of every new development that promises a more accurate weapon in our concerted fight on localized malignancies. The very pleasing fact is apparent that our American electrical engineers and manufacturers are sincerely anxious to devote their time, money and skill to the production of reliable apparatus which will give to us these precise instruments of utility.

Sufficient data is already accumulating to prove conclusively that the shorter electrical wave produced by higher voltages is destined to prove a more curative factor in our cancer work. While realizing the greater potential danger of these high voltage machines, let this not deter us in a united effort to master these accrued forces, to the end that we may evolve a uniformly standard technique, which will prove just as exact in our work as that of the scalpel in the hands of the highly qualified surgeon.

ALBERT SOILAND, M. D.

Registration of Technicians

WE are informed that there is now a bill before the state legislature of Massachusetts in session in Boston looking to the registration of x-ray technicians. We are not informed as to the text of this bill nor as to its program. We shall possibly be able to furnish more information later.

"Roentgenology as a Specialty"

THE following editorial, appearing in the Southern Medical Journal, March, 1922, issue, under the above subject, is such a sensible discussion of the question, that it is reprinted in full:

"The roentgen ray has probably contributed more to the recognition of gross pathology in the living subject than any other discovery of the past twenty-five years. Through a gradual process of development it has become not only of inestimable value in the diagnosis of disease, but also a very great aid in its treatment.

"Roentgenology has been brought to its present high state of attainment almost entirely through the efforts of men who have given intensified and highly specialized attention to the subject. No noteworthy exception to this rule can be recalled. This fact alone is ample justification for the existence of roentgenology as a medical specialty. There are, however, other equally important considerations which render its perpetuation as such highly desirable. In unskilled hands it ceases to be an asset, and actually becomes a menace. It is realized, of course, that one who is not a roentgen specialist may acquire considerable skill in roentgen diagnosis in certain restricted fields, but as a matter of fact even this is somewhat exceptional. It may, therefore, be stated as a generally recognized fact that no one can be expected to have a full and comprehensive knowledge of roentgen diagnosis and therapy who does not give it his full and undivided attention.

"Unfortunately the roentgenologist is not always accorded the prerogatives of a medical consultant, but is still regarded in certain quarters, both lay and professional, as a special kind of photographer, whose chief function is that of 'picture' making. On the contrary, he is first and foremost a physician who is specially skilled in the diagnosis and treatment of disease by means of the roentgen ray. His relationship to the practice of medicine is not essentially different from that of any other specialist, which, in addition to intensive training along special lines, presupposes a comprehensive knowledge of the fundamentals of medicine as a whole.

"This misconception of the function of the roentgenologist is at least one of the factors that has led to a very serious perversion in its practice. This consists in the widespread distribution of the so-called 'commercial laboratory' which grinds out 'x-ray pictures' at so much 'per.' These commercial laboratories bear a relation to the roentgenologist which is somewhat analogous to that of the spectacle seller to the ophthalmologist, but are far more pernicious, in view of the fact that they have a much wider field for exploitation.

"They are not only a menace to the public weal from a purely medical standpoint, but one of their chief dangers lies in the fact that they will greatly hinder the development of roentgenology along rational and scientific lines.

"It is quite true that roentgenology is one specialty that is perhaps, in certain quarters at least, somewhat undermanned. This fact may be advanced as an excuse for the development of the commercial laboratory, but the fostering of such laboratories, especially by the medical profession, may be regarded as one of the surest ways of aggravating the condition, granting that such exists.

"It is a regrettable fact that the medical practice acts of the various states do not construe the making of roentgen examinations to imply the 'practice of medicine,' thus placing roentgenology, in a restricted sense at least, in the same category with a variety of other pseudo-medical cults. Such an anomalous situation should, of course, be corrected. It is our purpose for the present, however, to point out the fact that the existence of the commercial x-ray laboratory depends in a very large measure upon the patronage of the medical profession itself. Some of the profession support the laboratories with a view to fostering and exploiting their own chicanery, while others do so through a woeful ignorance of the possibilities and limitations of the roentgen ray as a diagnostic aid. There is still a third group which gives them either active or passive support, simply because they have not given due consideration to the evils which such a practice entails. It is particularly to the latter group that we appeal for co-operation in correcting an evil which has already spread to an alarming extent."

DEPARTMENT of TECHNIQUE

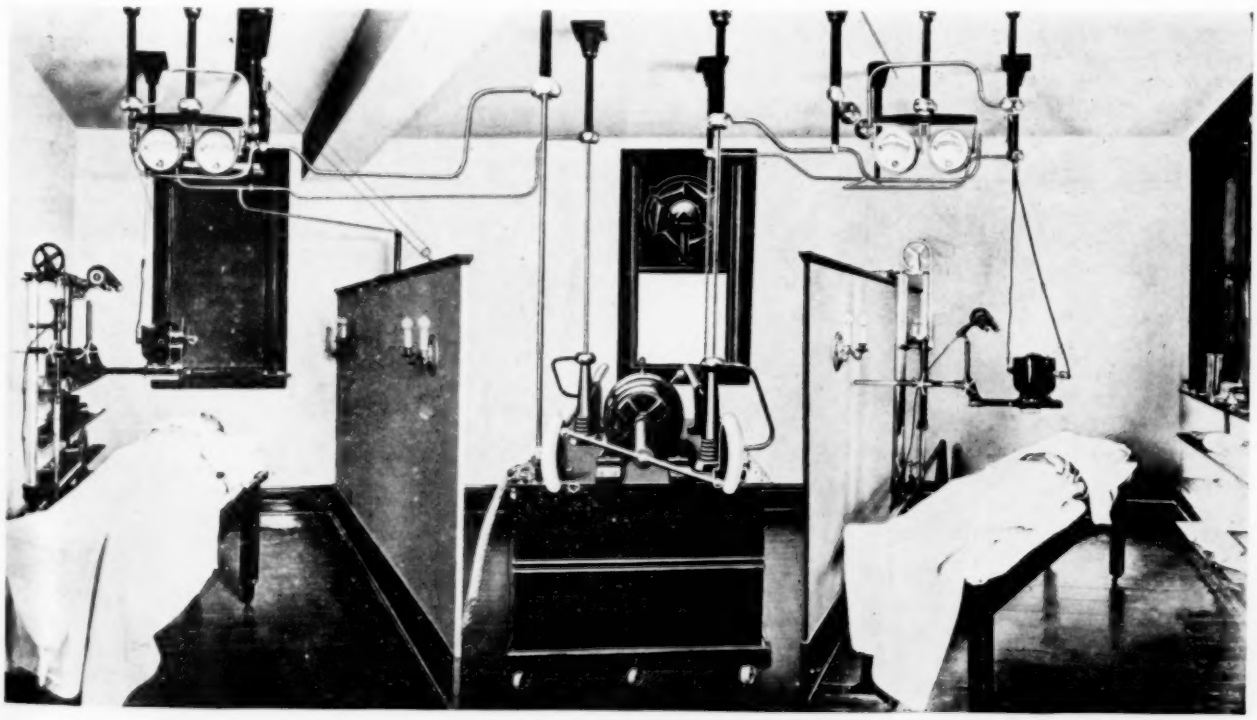
Deep Therapy Treatment Room

A. F. TYLER, M. D.
Omaha, Nebraska

IT will be recalled that in the February number of The Journal floor plans of my deep therapy department were shown. By referring to those plans you will see that the treatment portion is divided into three rooms, a transformer room in the center, with a treatment room on either side. You will notice that in the lead covered wall running across the north side of these three rooms there is a lead glass window through which the operator can observe both patients and the transformer in operation.

The illustration used this month is an actual photograph of the three rooms as seen by the operator through the lead glass observation window. On close examination it will be seen that the patient lies on a wooden table, that the tube and high tension connections are fifty to sixty centimeters above the level of the patient's body; and that the high tension circuit is made up of brass tubes measuring three-fourths inches in diameter. This effectively cuts off the effluve and consequently the production of large quantities of gas in the room. It will also be noted that in the window of the transformer room there is a Sorocco blower which when in operation exhausts the air from the room continuously, keeping it free from noxious odors.

We show this photograph to demonstrate the feasibility of this floor plan, the ease of operating and of placing the patient for treatment of various parts of the body, also the method of keeping the air free from bad odors, and the protection for the operator.



NEW EQUIPMENT

A New Deep Therapy Protection Shield

IN view of the extraordinary difficulties encountered in providing insulation and x-ray protection for a tube operated under nearly three times the highest voltage formerly employed, the Wappler Electric Co., of New York has expended considerable time experimenting to obtain the necessary experimental information for the design of a protective shield which adequately and efficiently takes care of all the factors presented by the new problem. They have, therefore, investigated in all details the following points:

First—efficient protection against the highly penetrating rays.

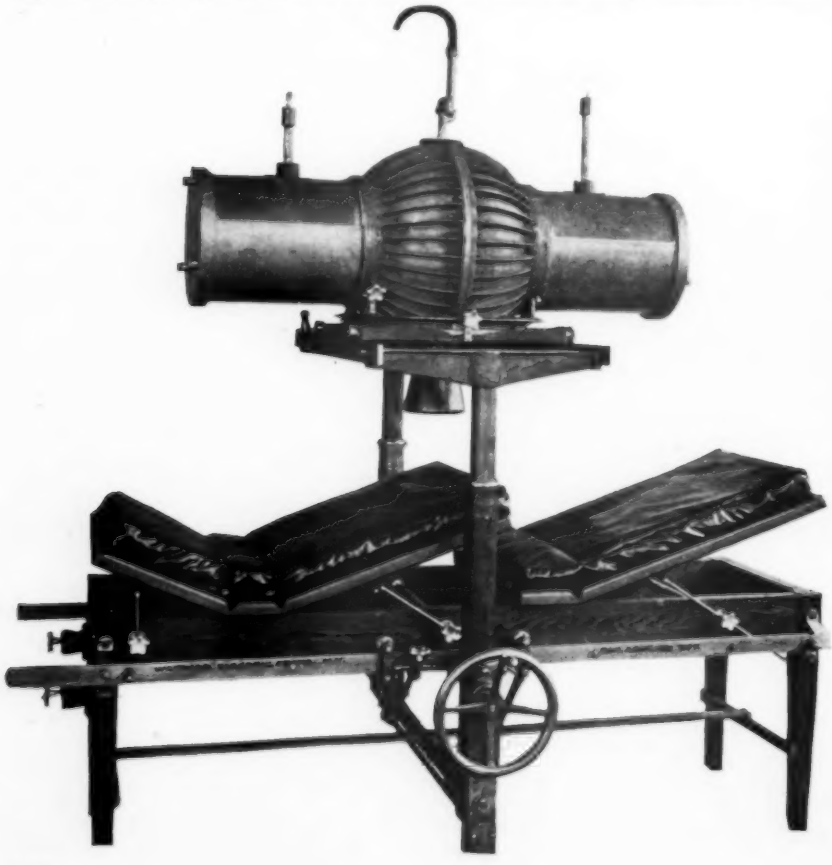
Second—efficient and dependable electrical protection for the patient against high tension shock.

Third—protection against the nitric fumes, oxone and static or corona discharges from the terminals of the tube.

After having extensively experimented with protection shields made of lead impregnated Bakelite and hard rubber, lead glass, etc., and also having extensively experimented with the tube submerged in oil, the engineers of the Wappler Electric Co. have arrived at the conclusion that these devices, while they may be sufficient for operating the tube up to a back-up of ten inches, are entirely inadequate for successful long period operation of the Deep Therapy Tube up to the maximum of eighteen inches gap. Moreover, after having made a very careful study of the electrical fields around the tube during operation, they have designed a metallic shield which completely surrounds the tube and which unquestionably offers the best solution to the requirements above enumerated.

ad 1—Protection against the x-ray is secured by making a drum, which surrounds the bulb of the tube consisting of metallic lead and supporting metal to an equivalent of one-fourth inch metallic lead. In connection with this they have found that this thickness of metal gives excellent protection, but that, on the other hand, if the tube is not completely enclosed, stray radiation and secondary radiation coming from exposed objects nearby are much more harmful and injurious than any rays which might possibly pass through one-fourth inch lead. In a case of further doubt it would be easy to increase the thickness to any desired extent. The tube, therefore, is completely surrounded with x-ray opaque material so that either with the fluoroscope or with photographic plates or even with an electroscope it is not possible to discover any way nearly the quantity of rays reaching the outside which is present if the tube is enclosed in a shield with projecting tube terminals or of such other shields as have been tried.

ad 2—The question of electrical protection of the patient has only timidly been dealt with in the past, but the mere fact that in this device the x-ray tube is enclosed in a metallic container which is grounded, creates electrical protection for the patient which in sureness and reliability is not approachable by any other device heretofore suggested. The tube shield can be touched while the tube is in operation with the full voltage.



ad 3—Both in Europe and in this country the question of protecting the patient against harmful effect of vitiated air, resulting either from having been exposed to the x-rays or from corona discharges at the terminals of the tube, have hardly been considered at all except in a few isolated instances. It is, however, definitely known that if all the vitiated air is efficiently removed the patient is then not exposed to these fumes and the after-sickness and nausea resulting from massive dose treatments are practically absent. When consulting a number of roentgenologists they all agree that the usefulness of roentgen ray therapy could be extended to another class of weaker patients, which otherwise might not be able to survive the treatment, if the harmful effects of the air vitiated by massive dosage of x-ray and high tension discharges could be eliminated.

In this unit the air which was acted upon by rays or which was subjected to the action of electric field is removed through a flexible rubber tube to the exterior. In the end of the tube box there is an air filter through which dried and dust-free air is aspirated into the tube shield. The suction apparatus re-

quired for this purpose can be placed anywhere, such as, for instance, in a closet or another room, and its noise can be diminished to such an extent that it can hardly be heard.

While thus all the principal requirements are very completely solved, the dimensions of this shield are by no means cumbersome or such that it is difficult to manipulate it. This shield is mounted upon a carriage which is supported on ball bearings, running on tracks alongside the table. The shield, located on top of this carriage, revolves on ball bearings in all directions. It also can be tilted sideways so that any practical angle required for deep therapy can be obtained without the necessity of manipulating the weight of the tube and shield. Furthermore, the patient is at all times fully protected against the high tension circuit, not only through the shield, but also through the grounded metal structure of the brackets, which is always between the tube terminals and the patient. To place the patient on the table the entire holder is pushed to one end of the table and the patient is then fully accessible for adjustment from three sides. Then without any effort the shield is rolled into position over the patient and adjusted to the proper angles and tilts. The height of the tube above the table is easily adjustable between heights of twenty-four and forty-four inches above the top of the cushion on the table.

High Tension Intermediate X-Ray Unit

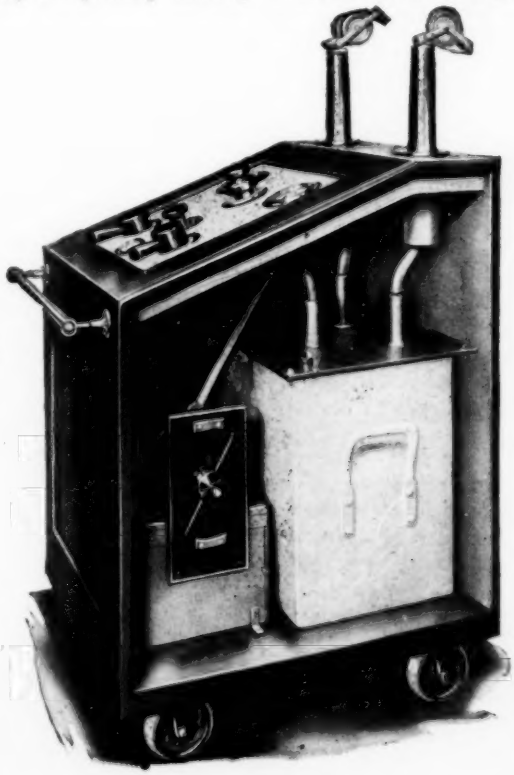
A RADICAL departure from the usual method of rectification in x-ray apparatus is inaugurated by the High Tension Transformer and Equipment Company of Hoboken, New Jersey.

Examination of the interior view of that company's Intermediate Unit, as shown in the accompanying illustration, discloses that by means of a rotary wave selector injecied into the primary circuit instead of across the secondaries, that company is able to build a machine much more inexpensively than is ordinarily the case. The rectifying apparatus under this plan, it will be observed, is very much smaller—indeed, one of the striking features of this Unit is that the entire rectifying mechanism is operated by a one-thirtieth horse power synchronous motor.

The argument advanced in justification of this theory of construction is that it is much more simple and inexpensive to rectify the primary current, at 220 volts for example, than to deliver that voltage to the transformer, step it up to 220,000 volts, and rectify the latter high potential with its consequent load on the transformer. There is this to be said of this method: It practically eliminates corona and static accumulation in the field of inducted energy, delivers a uni-directional current to the transformer, and permits much simpler and less costly construction.

So far as is perceived at the moment, such a plan of construction ought not only to be feasible and practicable in radiography and fluoroscopy, but also advantageous. There are a number of conditions known to every experienced radiologist which might conceivably be eliminated in this kind of work by having the rectification occur on the primary instead of the secondary side.

In the case of therapeutics, however, there is not sufficient information at hand at the moment to determine how, under this method of construction, it is possible to control the character of the wave actually delivered to the tube. Due to the question of lead and lag incident to the magnetizing and demagnetizing processes of the transformer, some serious questions are suggested, because it is vitally imperative in therapy work to definitely determine and control the character of the wave delivered into the tube in order that x-rays of the desired character and length may be produced.



Workers with this kind of apparatus will undoubtedly be interested in knowing exactly what effect the High Tension Company produces by its peculiar method of construction on the characteristics of the wave on the secondary side delivered into the tube, through the introduction of a rotary wave selector into the primary circuit. As they will also be interested in knowing the details of construction by which an absolute control of wave characteristics, so essential to therapy work, is established.

Without attempting to answer these questions, or to set up the biological facts involved in the problem, the suggestion is made that perhaps the High Tension Company has developed some plan, the result of its exploratory work, by which these features are adequately provided against; or that, if it has not, that perhaps their solution can be found by the introduction of a simplified rotary wave selector across the secondary terminals as well as in the primary circuit.

The Journal will be pleased to receive and publish information on this phase of the discussion.

The capacity of the Intermediate Unit is five milliamperes at a nine-inch gap. The unit is operable either on a 110 or 220 volt alternating or direct supply from the ordinary light socket. The complete unit consists of radiographic table, tube stand, tube shield, Coolidge tube (universal type) and the transformer. On the latter will be found calibrated spark-gap control, primary voltage control, and a simplified polarity indicator.

ABSTRACTS and REVIEWS

A Radiological Study of the Appendix, in Chronic Appendicitis. C. Jaisson, Jour. de Rad. et d'Electr. Vol. 5, page 256.

I.—RESULTS of study of the normal appendix show:

1—The appendix fills simultaneously with the cecum, about four hours after the ingestion of the meal.

2—There is a clear filling at least twelve hours after the meal, when the large intestine is completely visualized, and the rectum is partially filled.

3—At twenty-four to twenty-eight hours emptying and segmenting of the appendix begins and changes in position and form may result from its movement.

4—After thirty-two hours some residue is still to be found in the proximal portion, but none in the distal.

5—In the normal appendix filling takes place in a relatively short time, the emptying process takes a longer time.

II.—Findings in a chronically diseased appendix.

Characteristic Physical Signs

1—Uneven filling in repeated observations.

2—Kinking or curling of the appendix.

3—Shadow of the appendix appearing without bismuth filling, usually signifying calcification of the appendix or containing fecal concretions.

4—Vacuoles in the filled appendix.

Functional Signs

1—Immobility of the appendix resulting from inflammatory adhesions.

2—Tenderness not uncommonly found in an atypical location.

3—Delayed emptying about three days or more, in the normal thirty-six hours.

4—Exaggerated movements and strong segmentation of the appendix are of doubtful significance.

These observations were made on children. Two thousand three hundred gms. of barium meal was given in three hundred cc. of milk, after complete bowel emptying.

A. M. P.

Tuberculosis of the Stomach. Paul Biernath, Deutsch. Med. W., No. 37, page 1091.

SIX cases of apparently primary tuberculosis of the stomach have been described in the literature. The author observed a seventh one.

A widow of thirty-eight has had stomach trouble for thirteen years. For the past five months she suffered of flatulence, anorexia, constipation (contrary to the usual diarrhea), vomiting, and pain independent of meals or posture, and marked loss of weight. X-ray examination showed an hour glass stomach with marked narrowing of the lower third of the lesser curvature. Operation resulted in complete cure. Pathological examination revealed the tuberculous nature of the ulcer.

As the general and a thorough pulmonary examination for tuberculosis was negative, and as three injections of tuberculin after the operation were negative, the condition is assumed to have been a case of primary tuberculosis of the stomach.

A. M. P.

Radiological Studies of the Internal Organs of the Newborn. E. Vogt, Berliner Klin. W., Nr. 20, page 513.

THE studies are based on thirty-nine cases in which radiological observations have been made.

The living newborn has a barrel-shaped thorax, the ribs proceed in a horizontal direction, the upper thoracic opening is at right angles with the spinal column, the sternum stands high, and the epigastric angle is obtuse. This form is not rigid, but depends upon the function of the chest organs.

The lungs fill with air from below upward, earlier in the maturely born than those born prematurely. Very frequently the only cause of death in the premature is a persisting fetal atalectasis.

To examine the finer lung structures in a prematurely born of one thousand three hundred gms. weight after death, the author injected the respiratory tract with an opaque solution, which showed the open bronchial tree through the bronchioles down to the alveoli. A section of the hardened lung proved to be particularly interesting for study.

In medico-legal cases where it is necessary to determine whether the child had an extrauterine life, radiological examination should be used to complement the floating test. Roentgenograms of infants who never breathed show no internal organs, of those who breathed only for a short time a little air shows in the stomach and small intestine, and those who breathed actively for a considerable length of time show the lower lung portions filled with air. The form of the thorax is also significant, as the still-born child retains the intrauterine pear-shaped thorax.

The heart appears to lie crosswise. Characteristic is its globe shape and its proportionately large mass. The heart of the newborn is 0.89 per cent of the total body weight, while it is only 0.52 per cent in the adult. The thymus appears as a light asymmetrical shadow. The author remarks at this point that the thymic stridor has been treated successfully with roentgenotherapy. Congenital thyroid enlargement is often accompanied with enlarged thymus. The diaphragm shows up sharply.

Of the abdominal organs the stomach shows up best. Its axis is parallel with the body axis. The pylorus is to the right of the midline, and is elevated above the greater curvature. With breast feeding the food remains about two hours in the stomach, but in artificial feeding the emptying time is longer.

The liver occupies a large space in the abdomen. It projects from the costal arch and reaches to the level of the navel. It covers portions of the stomach. The small intestine contains some air and upon ingestion of the opaque meal a fine wave can be observed. The colon is rather long, the cecum lies in the right iliac region, the ascending colon makes an obtuse angle with the transverse colon at the hepatic flexure, and the transverse with the descending colon make an acute angle at the splenic flexure. The haustral formation is the same as in the adult. The descending colon reaches over the mid-line and makes many loops. The free mobility, the long meso-colon, and the loop formation bear some relation to the rise of Hirschsprung's disease. The ampulla recti and pars analis of the colon are easily recognized.

Of special interest is the stereoscopic examination of the injected arterial system. The blood vessels and capillaries are of wider caliber, due to low blood pressure. Particularly wide in caliber

are the vessels going to the brain. The umbilical arteries were found to be fully pervious to injection the first few days. The strength of their walls were about the same as those of the common iliac. In all injected specimens the pulmonary artery was clearly outlined, which proves that the ductus arteriosus Botalli remains open for some time.

The kidneys are seen in their normal location. The right kidney is only slightly lower than the left. The embryonal lobulation of the kidney is evident in the injected preparation.

A. M. P.

The Action of Radiotherapy on Tumor Albumins in the Serum. Loefer, M. Debray and Tonnet, Compt. Rend. des Seances de la Soc. de Biologie, Vol. 85, page 279.

THE observation that the serum of cancer patients is particularly rich in albumen, and especially in globulins, leads us to the assumption that this increase is the result of processes which bring about a resolution of tumor cells.

Radiation of inoperable tumors of the colon, stomach, liver and breast up to eighteen H in two-thirds of an hour under normal intake of food and fluids, showed an appreciable increase of albumen in the serum on the second day, and a very marked increase on the third day. Of the various albumens the globulins were chiefly marked.

Simultaneous investigation of the pepsin and amino acids in the blood serum showed a decrease of the erepsin titre, as well as of the other products of albumen metabolism.

A. M. P.

Pneumoperitoneum in the Diagnosis of Ecchinococcic Cysts of the Liver. F. Partsch, Deut. Med. W., Vol. 47, page 923.

A NUMBER of cases of ecchinococcus cysts of the liver, studied in the chirurgical clinic of the Rostock University during an epidemic in 1920, lead to the following conclusions regarding the diagnosis of this condition.

In case the cystic enlargement of the liver is not palpable, if the cyst lies posteriorly or under the diaphragm, in absence of compression phenomena (ascites, icterus) or of secondary involvement of the diaphragm and pleura, we only have the findings of an eosinophilia and the usual x-ray examination. Sometimes the diaphragm is bound up by adhesions or held high, but the frequent complication of pleurisy obscures the field.

In two cases a sickle formation of the barium filled stomach gave the clue to the existing cyst. Inflation of stomach and colon did not give satisfactory evidence. The only satisfactory and reliable evidence was furnished by the pneumoperitoneum x-ray examination. The following evidence was obtained:

1—Changes of contour by projections of the cyst walls.

2—Changes of transparency. As the liver tissue is congested the cystic areas appear more translucent. In no case did the author observe any calcific deposits in the cyst walls.

3—Presence of adhesions.

4—A number of free air filled spaces are noticed to intervene between the liver surface and the diaphragm, and also between the former and the anterior abdominal wall. It is due to the fact that the uneven surface of the cystic liver cannot be applied against the diaphragm or abdomen.

5—It is differentiated from metastatic nodules by the fact that the latter is usually denser than the rest of the liver tissue. In the latter case the liver shows a much greater irregularity of the surface, and has no adhesions.

Contraindications are chiefly those of intra abdominal disturbances, such as meteorism, tension of abdominal walls, possible perforations, and heart disease. All the cases were performed successfully, and the author thinks pneumoperitoneum a very valuable diagnostic procedure if carried out properly and carefully.

A. M. P.

The Physical Foundations of Deep Therapy. Albert Bachem, Ph. D., Frankfort, Germany. J. Radiol., April, 1922.

THIS is a paper dealing with Professor Dessauer's methods of deep ray therapy, worked out at Frankfort, University, Germany.

Dessauer's law of homogeneous radiation includes both a qualitative and a quantative homogeneity. By qualitative homogeneity is denoted a mixture of rays consisting of wave components which do not materially change when penetrating the deeper parts: by quantitative homogeneity is meant absorption of the same amount of rays in different depths of tissue.

Dessauer was the first to point out that when raying with homogeneous radiations the problem was simplified by estimating the transmitted, not the absorbed, energy for the study of biologic effect. To do this the law of absorption as well as scattered radiation must be considered along with other things, e. g., the size of the field.

Since water has the same power of absorption as human tissue, Dessauer made his experiments in a water phantom. The absorption factor, for water, is 0.14 to 0.18. The three variable factors are distance, size of field and quality of ray. With these the distribution of rays in the radiated medium was studied. Some unexpected results were revealed by this method, e. g., parts protected from the direct rays receive quite a large amount of radiation through scattering from the part radiated.

With the charts made in this study an exact plan of treatment may be formulated. The original article is illustrated with fifteen of these charts. The charts and tables worked out in this research are soon to be published in the English language. The author illustrates how the treatment is worked out for a carcinoma of the uterus having an invasion of the parametria and metastases in the lymph glands along the bony walls of the pelvis.

Similar charts have been constructed to study the action of radium radiation. These also are based on the erythema skin dose, and by a combination of charts the combined treatment with radium and roentgen ray may be arrived at.

In conclusion it is stated that it is possible to ascertain in advance, by physical means, the quality of rays furnished by any apparatus and also the time required to produce an erythema skin dose, the penetrability of the ray and the proper filtration. The multiple small field method of x-ray therapy must be replaced by the large field method to prevent the loss of the therapeutically important scattered radiation.

Treatment of Focal Infection of the Throat by X-Ray as Compared with Surgical Removal of Tonsils and Adenoids. W. D. Witherbee, M. D., New York City. Journal of Radiology, April, 1922.

THE predominance of lymphatic and embryonic tissue in both forms of tonsil, the tonsil consisting mainly of the former and the small fibroid tonsil consisting mainly of the latter, and the fact that these types of tissue are more easily destroyed by the x-ray than any other tissue is the principle of the author's method.

Cultures made from the tonsils after raying bear out the opinion that they have been rendered sterile. A series of diphtheria carrier cases (Hickey) gave eighty per cent free from the bacillus after two to four deep rayings.

The technique used by the author is as follows: seven inch spark gap, five milliamperes, four minutes time, ten inch distance and three mm. aluminum filter. The position and angle of the patient and tube corresponds exactly to that employed in making a radiograph of the lower molars. The number of treatments is usually about eight

given at intervals of two weeks, both sides of the head exposed at each treatment.

The x-ray method of treating chronic focal infection of the throat, namely, tonsils and adenoids, is not only safe and permanent, but will more thoroughly and completely remove this focal infection than any other method, surgical or otherwise, yet devised... Furthermore, the contraindications for operation in no way interfere with this form of treatment and there are no complications providing the technique is faithfully carried out. Freedom from burns also depends upon this factor.

There is no danger to the parotid, the thyroid, the pituitary or other glands.

The X-Ray Diagnosis of Accessory Sinusitis. James Gerritt Van Zwaluwenburg, M. D. Am. J. Roentgenol, January, 1922, page 1.

IT was Dr. Van Zwaluwenburg's belief that x-ray diagnosis of sinusitis has not been as widely employed as it should be, owing to the fact that it is a task beset with unusual difficulty. He wrote the above paper in the hope that this situation might be remedied through relation of his experience in dealing with this phase of disease at the University Hospital at Ann Arbor.

He advocates in this paper the application of old principles, but the adoption of a simpler and more comprehensive technique. He considered the following requirements to be essential to success:

1. The structures of the nose and of all the sinuses should be demonstrated at a single routine examination.
2. Opportunity should be offered for the direct comparison of symmetrical parts.
3. Since the confusing shadows of the structures of the base of the skull and the cervical spine cannot be obviated by any one position or projection, sufficient differentiation of these structures should be offered, that their shadows may be recognized and separately appreciated and evaluated.

The technique which meets these requirements has several important though not new features. It provides for a strictly saggital projection, covers all of the region under examination at one time, demonstrates satisfactorily the structures of the nose, and depends upon stereoscopic vision to differentiate the petrous portions of the temporals and the cervical spine and to lift them out of the region that is the subject of special study.

"Everything depends upon the fineness of detail in the posterior portion of the field. This can be accomplished only by the fine focus radiator type of tube." The thirty ma. tube was found unsuitable; instead was used the ten ma. radiator type, loaded to eight ma. under a tension equivalent to about five and one-half or six inch back-up spark. "A long cone with a small diaphragm is employed providing a circle of illumination on the plate not exceeding five inches in diameter. The patient lies prone with the forehead in contact with the plate changer, which is inclined at an angle of twenty-two degrees from the horizontal. The position of the focus spot in the saggital plane is determined by a line passing from a point just below the outer canthus of the eye through the external auditory meatus and upwards. The head is fixed by a thin pad of cotton, which is covered by an aluminum hemisphere and held in place by the pressure of the cone which is lowered upon it. The exposure time is approximately two hundred and forty ma.s. For the second plate of the stereo set the tube is moved caphalad two and one-half or three inches."

Stereoscopic vision depends directly on the sharpness of definition and this can be attained only by using a very small focus spot at a considerable distance and with a narrow cone. The importance of this cannot be overestimated.

The plates must show the lateral procasses of the atlas and axis and the tip of the odontoid process, which should lie in the mid-line and not reach above the lower third of the septum of the nose. The position used throws the long axis of the ethmoid labyrinth almost directly in the line of vision, but the greater brilliancy of the stereoscopic image is depended upon to distinguish the position of the shadows.

Chronic sinus infections are sequelae of pre-existing disease in the nose and teeth and infections once started may be prolonged by nasal pathology, therefore the nose must receive as much attention as the sinuses.

In acute infections of the sinuses the cells appear denser than the normal owing to replacement of air by denser material, but unfortunately in the small cavities so little is added to the density that little trace is left on the plate.

Purulence leads on to extensive sclerosis and osteoplastic changes in the bony septa and walls of the sinuses—hypertrophies and increased densities result and interfere with the drainage, thus a vicious circle is established. On the other hand, the process may result in polypoid degeneration and the effect on the plate is entire occlsion of the upper nasal passages, with an abnormally free space below the level of the lower margin of the middle turbinates.

The fact that the purulent type leads to deposition of bony tissue in the subperiosteal layer and the hypertrophied type leads to osteoporosis is of marked interest. Dr. Van Zwaluwenburg's experience was that true polypoid disease is more commonly general than limited in its distribution. The exact relation of the purulent and the polypoid types is still unsettled—a nice problem which the writer believed the roentgenologist must aid greatly in solving.

The chronically diseased sinus is relatively small in size. Acute sinus infections are frequently bilateral, thereby depriving the roentgenologist the advantage of comparison with the normal, but it is seldom that his aid is needed in diagnosis of acute infection. However, intra-nasal conditions that predispose to chronicity may be demonstrated and here the effort of the roentgenologist may aid the surgeon.

In acute polypoid disease the case is sometimes one of polypoid degeneration of the mucous membranes from the beginning. These invariably escape detection by the x-ray, perhaps because of a compensatory loss of density in the bony wall of the affected part.

In acute purulent sinusitis the signs are an osteoplastic process in corresponding chambers and contiguous portions of the nose and frontal bone. The process is usually unilateral, there is a greater density in the affected region and the outlines of the individual cells are well marked. Group infections are the rule. The contiguous portions of the nasal wall, especially the root of the middle turbinate, partake of the sclerosis. In the antrum the diffuse opacity of the entire chamber is probably due to retained exudates in part, but mostly to the thickening of the antrum and posterior walls.

The general opacity is not so striking in the ethmoidal group and comparison with the opposite cells in comparable position will aid in determining the increase in density. It is necessary here to differentiate from hypertrophy of the turbinates. Solitary infections of the ethmoids are uncommon. Changes in the turbinates are usually absent. Except as a complication of frontal sinusitis involvement of the anterior ethmoids is rare.

In the frontal sinus the main reliance for diagnosis rests upon the condition of the infundibulum, which invariably shows distinct changes. "Satisfactory plates will show this structure beside the lateral walls of the upper nasal fossa except when they are entirely normal.

The infundibular walls are early thickened and the cavity obscured."

The sphenoid normally has walls that are paper thin "and the cavity is strikingly clear. When infected the increased thickness of its wall is conspicuous and the general density is much increased. The distinction between a sphenoiditis and the occurrence of an intranasal opacity as a polyp may be extremely difficult."

Associated involvements will give a clue in trying to locate the site of chronic purulent disease.

"Differential diagnosis must take into consideration the rare cases of failure of aeration of the accessory sinuses and the persistence of cancellous bone throughout life. This is most frequently seen in the maxillary and presents a very confusing picture." Uniform distribution of shadows, smaller size of the maxillary on the affected side and the failure of a definite cortical layer on both sides of the relatively thin wall of the normal antrum all aid in the recognition of this condition.

The appearance of the plate in polypoid diseases of accessory sinuses contrasts markedly with the above description of the purulent types. Osteoporosis of the bony walls and exclusion of air by an overgrowth of mucous membrane are the marked features here and destroy in the plate the differentiating details of the normal cavities. The process varies with the chronicity of the disease, it is usually bilateral and symmetrical. "The distinction between this condition and polyps secondary to the purulent type of the disease and the fibromata and myxofibromata arising from the mucous membranes of the nose must be sharply drawn."

The structural changes in bone described in this paper do not regularly follow acute sinusitis, nor even repeated attacks if of short duration. During intervals of freedom no appreciable changes will be found, as a rule, though the writer questioned whether entire freedom from infection ever exists after a chronic attack unless operation has intervened. The situation he compared to a chronic and a latent appendix.

The surgeon, failing to find infection during a period of freedom, may consider treatment unnecessary, but this is one of the times the roentgenologist should insist upon the value of his findings receiving recognition. The more serious difficulties with the surgeon arise in the earlier stages of the disease. "A certain degree of difference is essential to helpfulness. Differences of opinion may be adjusted, but differences of observation must be explained. If the problem can be approached by both in a spirit of mutual respect for the observations of the other, both must profit by the study of their differences in opinion, with ultimately a closer approximation to the truth on the part of both."

The Alveolar Radiogram. Joseph A. Pollio, M. D., San Francisco, Cal. Jour. National Dental Asso., January, 1922, page 36.

THE alveolar process is or should be the real object of the radiogram, for upon the condition of the bone beyond the root depends the next therapeutic step. "Alveolar radiogram" is therefore a preferable term to "dental radiogram."

No other part of the body is so difficult to accurately radiogram as is the mouth, and the demonstration of the changes around the teeth requires more than good films, correct exposure and proper angles; good radiograms depend upon three fundamentals—experience, equipment, and the dark room.

The dark room "is the most prolific source of technical artefacts." It must be absolutely light proof. The time of development, temperature, the ingredients of solutions, and the methods of development are of the utmost importance.

Proper illumination has been a grossly neglected factor. To study a radiogram by window light necessitates that the radiogram be made darker than it should be, and thereby minute yet very important details are erased.

The future of dental radiography depends upon the consistent demonstration and recognition of early disease changes in the teeth and their alveolar processes, but these things will never become routine until good radiography is demanded, and it never will be demanded until dentists have been taught what good radiography is, what it should show and upon what principles it depends. It is not advocated that dental students become radiographers, but something more should be taught them of this work in order that they may demand what their patients are entitled to.

The uncertainty that exists as to the value of radiography in dentistry is not due to the radiogram, but to the kind of radiography. The dentist should be enabled not only to decide upon the extraction or the retention of a tooth, but he should be enabled to recognize disease before it has spread far enough to become a problem.

Too often only gross lesions are recognized, too often exact knowledge of the normal is lacking and therefore true knowledge of the pathological cannot exist—but nevertheless in an appaling number of cases the plate is interpreted under just such limitations.

The normal alveolar process has irregular cancellations (due to the haphazard way the lamellae are arranged and united) and harmonious blending of the lights and darks, which is due to the balanced distribution of calcium salts. The normal strands of bone tissue will show as thin delicate white lines inclosing dark or black irregular areas (the cavities) and no matter how old the patient may be this irregularity persists in health, though in the older cases the strands will be more distinct because of a greater percentage of calcium salts. Whenever this cancellated structure becomes *regular, ill defined and homogeneous* then pathological processes are taking place. Diminution of calcium salts will allow the rays to pass more freely—result, a darker spot in the film and vice versa. Areas of old extraction are by no means all normal and may be the source of focal infection.

The normal tooth has two structures, the peridental membrane and peridental lamellae, the relationship of which is distributed by the slightest pathological activity and therefore acts as a guide in interpretation of the radiograph and determination of therapeutic measures.

The peridental membrane shows as a fine, even, black line (because it is a soft tissue) outside of the cemental border of the tooth and slightly thicker at the cervical border. The peridental lamellae (the author objects to the terms, "cribriform plate," "linea dura," "lamina dura," "stratum durum") is a thin layer of compact bone immediately beyond the peridental membrane and forms the outer edge of the alveolus. It has numerous openings for the attachment of the fibers of the peridental membrane. Normally it has the same thickness all the way around and fits the tooth perfectly. It is the closest bony structure in relation to the tooth and lies between the tooth itself and the alveolar mass. Any pathology within the tooth before it can reach the cancellous portion of the alveolar process must alter or destroy the peridental lamella; it accomplishes this by first attacking the peridental membrane, which then hypertrophies and pushes out the peridental lamella, making it sag. A thickening of this fine black line anywhere indicates an inflammatory process.

To repeat, radiograms should be inspected for irregularity of cancellations, harmonious blending of lights and darks in the bone, the fine black line and the fine white line around the tooth.

The *Pathological Meaning of Radiographic Variations in Density.* Radiographic variations may be ana-

tomical or pathological. The anatomical have been described above.

Many teeth are daily extracted because the meaning of a radiographic alteration in density is not understood. If the variation in the radiogram is due to excessive occlusion the tooth can be retained with proper remedial measures, but if it is due to infection satisfactory retention is very doubtful.

No one influence shows a specific radiographic abnormality. The same influence may produce radiolucence or radiopacity. Alveolar lesions due to severe chemical reagent may, radiographically, present the same appearance as a so-called apical abscess.

Harmonious blending of the lights and darks depends upon balanced distribution of the calcium salts and this depends ultimately upon nutrition of the part and this may be modified either by lessening it or increasing it.

Lessening nutrition induces absorption of the lamellae, which are replaced by connective tissue and vessels of various form. This diminishes resistance to the passage of the rays, therefore increased radiolucence results and the film shows a dark spot. Disease, excessive use, trauma, chemicals, pressure and bacteria may bring this about, but which one of these is the responsible agent cannot be judged from the changes in the structure.

A morbid increase of nutrition results in the deposit of more lamellae and therefore in radiopacity. The underlying cause may be infection, mechanical trauma or excessive occlusion, thermal shock, defensive reaction and an unknown influence producing a dense compact bone change which has no Haversian system.

Eburnation is the only true exostosis found around the teeth. Exostosis (due to osteoblastic influence) is different than hypercementosis, which is a cemental process and a term often misused.

The following radiographic classification is given of dental changes, which in the main are grouped into three classes:

I.—Dentulous Localized Alveolar Atrophy:
- 1—Disuse—teeth have no opponents, bone atrophy increases radiolucence.
- 2—Mechanical Trauma — excessive or hyperocclusion, lateral oftenest affected and cyst often present.
- 3—Chemical—disintegration from harsh reagents and filling material in root canal therapy.
- 4—Pressure — pericamentomata (apical abscess, granuloma and hockey), cystic pericementoma, and true cyst (any area which has dissolved the bone to an extent of three-eighths of an inch in the radiogram is probably cystic).
- 5—Bacterial—any area of increased radiolucence around the apex and at some part in either the distal or mesial margin of the tooth root, and having a regularity of loss of cancellations, probably belongs to this type.

II.—Dentulous Localized Alveolar Hypertrophy:
- 1—Infective — bacteria enmeshed in layers of lamellae, unless the exciting factor is removed the bone continues to accumulate until it produces serious symptoms through pressure upon some vital structure, e g., inferior dental canal.
- 2—Mechanical trauma—often explains a stubborn alveolar absorption.
- 3—Thermal shock—before pulp degeneration has occurred, after that is atrophic so the inner part gives increased radiolucence and the other increased radiopacity.
- 4—Defensive—secondary to atrophic infective process, may produce impingement.
- 5—Unknown — producing eburnation, very rare.

III.—Edentulous Areas: First pointed out by Joseph Novitzsky in 1918, and sadly overlooked:
- 1—Atrophie—
  - (a) Chemicals—used after extraction.
  - (b) Pressure — from retained pericementoma and cysts.
  - (c) Infective — retained root fragments, poor surgery, lowered local resistance.
- 2—Hypertrophic—
  - (a) Infective—bacterial activity persisting after extraction.
  - (b) Defensive — reaction against bacteria in a retained area of infective atrophy.
  - (c) Eburnation — often overlooked because of its very hard structure and because extraction was done without radiograms taken.

Tumors are classed between the atrophic and hypertrophic divisions in the dentulous and edentulous headings. They may be manifested by radiolucence and by radiopacity.

The Use of the Fluoroscope for Reducing Fractures. G. L. McWhorter, M. D., R. A. C. S., Department of Surgery, Rush Medical College, Chicago. Illinois Med. J., February, 1922. page 102.

THERE is slight recognition of the value of the fluoroscope in reducing bone fractures.

Its use is indicated in all types of fractures in which there is any deformity or where it would be an advantage to secure better alignment.

The majority of cases can be safely transported to the x-ray room after the injured part is immobilized. Roentgenograms for detailed inspection are first made in two planes. These two views will usually determine the amount of the deformity and give the relations of the bony parts.

The patient is then placed upon the fluoroscopic table—a general anesthesia will be necessary in a majority of badly deformed fractures, though occasionally a local anesthetic or even morphine alone will do. Some form of permanent splint and bandage is made ready and then under actual fluoroscopic examination the reduction is accomplished. The parts are examined in all planes possible to get the best results in reducing and the permanent dressings are applied, using great care not to disturb the alignment.

If plaster of paris is used, while it is hardening, observation under the fluoroscope is continued and any slight deviation from alignment corrected. A surprisingly short time is taken to reduce even difficult fractures. The advantages are summed up as follows:
- 1—Anatomical approximation of the fragments may be most perfectly obtained.
- 2—Fewer manipulations are necessary.
- 3—Less trauma results to the fractured ends and to the soft parts.
- 4—Avoidance of prolonged or increased hemorrhage.
- 5—Complications such as injury to nerves or large blood vessels avoided and danger of myositis ossificans lessened.
- 6—All angles of observation may be secured.
- 7—The neighboring parts are at the same time put in the best position for repair.
- 8—Repeated reductions avoided also many open operations. If operation necessary it is discovered at once. The parts are in the best possible condition for repair and healing.
- 9—Poor or fair results avoided.

Epithelioma of the Face and Their Treatment with Radium. Howard Mann, M. D., and Lawrence Tausigg, M. D., San Francisco. Arch. Dermat. & Syph., January, 1922, page 72.

AFTER the age of forty years epitheliomas make up a large per-

centage of all chronic facial lesions. Basal cell epitheliomas and the squamous cell epitheliomas are the two main classes of facial skin cancer. The former is the more common type, occurs oftener in men than in women, and is clinically subdivided into the following classes: the rodent nodule, the superficial ulceration, the deep ulceration, and the cicatrizing variety.

The great majority of these facial epitheliomas have been associated with seborrheic keratoses and may run for years before showing malignancy, or malignancy may develop shortly after their first appearance. Chronic irritation, the author believes, has but little influence in developing malignancy, but becomes a factor afterwards.

The very extensive lesions with or without bone development are the most difficult to treat, and their successful eradication necessarily involves resultant deformity. When situated in the canthus some form of treatment is demanded which will not eradicate the lid. The majority of dermatologists now admit that in most cases of basal cell epithelioma radiotherapy alone or in combination with curettage is the treatment of choice. The time which this takes is the only disadvantage; the advantages are painless application, small resultant scar and as few recurrences as from any other mode of treatment.

In the extensive cases radium is the only satisfactory form. If the bone is involved curettage should precede radiotherapy, which is then applied to produce a shallow bone necrosis. After removal of the resultant sequestrum, and healing, plastic surgery may be employed. A constant lookout must be maintained for recurrences.

In treating a superficial rodent ulcer a full strength plaque, screened with a rubber dam only or with 0.1 mm. of aluminum is fastened over the lesion for a total dose of from three to four hours divided between two or three successive days. If the lesion is relatively deep then from 0.3 to 0.5 mm. of brass is employed as a screen and the time increased to five or six hours. In the rare cases when tubes are used the dosage is roughly forty millicurie hours per square centimeter of surface so distributed that there is one tube to each square centimeter. The usual screen is 0.5 mm. of silver and one mm. of rubber tubing. With buried tubes the dosage should not exceed one or two tubes of 0.5 millicuries each augmented by screened applications to the surface later on. Severe reaction beginning about the seventh day and extending to the fourteenth day may be expected with any of these methods. The edges of the rodent ulcer must be thoroughly irradiated. The advantage of radium over roentgen ray is that the reaction from the former heals eventually without undue scarring, whereas disastrous after effects may follow the use of the latter.

Epithelioma of the ear is very difficult to treat. Surgical treatment gives poor cosmetic results and intractable action has been reported following radium. The writer states that he has found this reaction to be severe, but that it clears within a reasonable time and results have been good. The technique is similar to that for other superficial lesions except that a thicker screen and relatively longer time should be employed. Buried tubes should be used only in very extensive and fungating cases. Regional lymph nodes should be irradiated with roentgen rays unless positive that the lesion is of the basal cell type.

In lesions of the lip a deep tight keratosis clears promptly and permanently under adequate radium treatment. A half or full strength plaque of sufficient size to cover the lesion is screened with 0.1 mm. of aluminum and applied for a total of two to three hours. Early epithelioma of the lip with palpable, mass and apparently limited to the superficial structures can be readily cured by surface applications in plaques or tubes. With the plaque a full strength application screened with 0.1 mm. of aluminum and a total dose of four to five hours is given in two to three sittings. If the tubes are used a screen of 0.5 mm. of silver and one mm. of rubber is employed, giving from forty to fifty millicurie hours to each square centimeter. Cervical glands should be watched for some time after treatment and prophylactic treatment given if necessary.

In more extensive lip cases surgical removal with dissection of the regional lymph nodes "is usually satisfactory, but for a number of reasons it may be desirable to treat it with radium" and in this case, in addition to the surface treatment given superficial cases, two to eight bare tubes of 0.5 to one millicuries each should be buried in the tumor and the lymph glands of the neck irradiated with the roentgen ray or a radium pack. With the roentgen ray is used sixty milliampere minutes at a ten inch skin distance, with a ten inch spark gap and five mm. aluminum filter applied to each of three areas every three or four weeks for three or four times. If a radium pack is used then three thousand to four thousand millicurie hours at three centimeters filtered through two mm. of lead may be used on each of three areas every four or five weeks for three or four times. Palpable nodes should be surgically removed a week or two after the first irradiation and the areas subseyuently irradiated again. Very extensive carcinomas of the lip are equally hopeless under radiotherapy and surgery, though palliation is secured in some cases by conservative radiotherapy.

In the treatment of basal cell carcinoma of the face it is seldom necessary to employ buried tubes; surface application, except in very extensive cases, is usually satisfactory. In the majority of squamous called carcinoma buried bare tubes in conjunction with surface applications have been very helpful. In the treatment of deep carcinomatous infiltrations buried tubes are almost a necessity.

Radium in Cancer of the Bladder. George Gilbert Smith, M. D., F. A. C. S., Boston. Surg. Gynec. & Obst. November, 1921, page 570.

THE treatment of cancer of the bladder by surgery has given satisfactory results in only a small proportion of cases.

The Huntington Hospital in Boston began the use of radium on their cases in 1916, and from September, 1916, to January, 1921, twenty-four cases were so treated. Fifteen of these had been operated on before and nine were judged, after cytoscopy, to be unfit for operation. There were no benign papillomata in the series.

Two types of treatment were used, the earlier one employed screened radium emanation applied to the interior of the bladder, attempting to apply it as closely as possible to the region of the tumor. The later type of treatment employed bare emanation tubes or else steel needles implanted directly in the tumor.

From a study of these cases it is concluded that four hundred millicurie hours given with a screening of 0.5 mm. or one mm. of silver may be used without any very marked reaction. If suprapubic drainage is used greater doses may be employed, and if urine is entirely excluded from the bladder one thousand millicurie hours cause no discomfort.

The duration of reaction is from four to six weeks with moderate treatment. If no reaction has developed in three weeks after the first treatment the second one may be given then.

Hemorrhage and cystitis decrease after a single radium treatment. Large infiltrating carcinomata involving large portions of the bladder wall cannot be cured, but superficial cancers may be reduced. However, if the tumor begins to grow again, further treatment with radium has little effect.

Implantation of bare emanation tubes in the tumor—one to each cubic

centimeter, is the best method. Steel needles may be employed the same way, but must be withdrawn after adequate exposure. The necrosis caused by the implantation of radium in the bladder tumors persists at least three months.

Value of Pneumoperitoneal Roentgenography in Obstetrics and Gynecology. Reuben Peterson, M. D., Ann Arbor, Mich. Jour. A. M. A., February 11, 1922, page 397.

EXTENSIVE employment of this method during the last eighteen months at the University of Michigan Hospital leads the author to say that the safety of the method has been established without a doubt.

He seeks to give an answer to the question "What is the value of this method as a diagnostic procedure?"

Out of three hundred and twenty-five cases in which this method was employed only those operated upon after gas inflation (one hundred and thirty-eight) are here considered.

Just how these roentgenographic diagnoses were made was explained in Dr. Van Zwaluwenburg's paper in the March Journal of Radiology. Every patient was gone over pro and con prior to gas inflation and if any doubt existed the procedure was decided against.

By mutual agreement between the author and Dr. Van Zwaluwenburg, the roentgenologist, the diagnoses were arrived at independently by each of the two men, and the author concedes it to be remarkable in what proportion of cases the roentgenologist, who was working in a practically new field and without knowledge of the clinical histories involved, gave the correct diagnosis.

The roentgen ray report was after wards gone over in connection with the clinical findings and the operation decided upon or decided against.

In fifty-four cases of salpingitis the clinical diagnosis was correct in *thirty-three* cases, or sixty-one per cent and the roentgenological diagnosis correct in *twenty-four* cases, or forty-four per cent. In the remaining cases the roentgenological diagnosis was partially correct in twenty-one cases and incorrect in nine cases. It must be kept in mind that the roentgenologist arrived at his diagnosis by the roentgenograph alone, with no help from the clinician's findings or the patients' histories.

From this experience it is deduced that the pelvic roentgenogram, plus a careful bimanual examination, is the next best method to direct palpation and in time, with added experience, may be almost as effective.

In early pregnancies (sixth to the tenth week) the pneumoperitoneal method has been exceedingly valuable, the condition being positively diagnosed in eight such cases with no knowledge of history or findings.

Other pelvic conditions, such as fibroids with and without diseased appendages, small pelvic growths, unruptured ectopic pregnancies, etc., have been diagnosed by this method, but times does not permit the discussion of these.

The pneumo-peritoneal roentgenogram is an invaluable aid and the author states that its use would be abandoned with the greatest reluctance in his clinic.

Treatment of Acne. Cosby Swason, M. D., Atlanta, Ga. Southern M. J., January, 1922, page 27.

THE treatment of this disease has always been unsatisfactory. The acne bacillus is found in nearly every skin and predisposing causes develop it. In one thousand and twenty cases treated by the author in the past ten years the conditions named below were found present in the percentages given:

Aggravated form of seborrhea of scalp	50%
Constipation	45%
Gastro-intestinal trouble in some form	42%
Diseased and enlarged tonsils	40%
Infected teeth and gums	22%
Other skin diseases	8%
Rheumatism, so-called	7%
Dysmenorrhea	5%
Syphilis	1.5%
Nephritis	1%
Pulmonary tuberculosis	0.75%
Malaria	0.50%
Enlarged thyroid	0.20%

Each patient has to be dealt with according to symptoms present. Focal infection, constitpation, menstrual disturbance, urinalysis and diet must all receive appropriate attention. Local treatment is not to be lost sight of.

The author has found that x-ray gives the most beneficial and lasting results and would be reluctant to treat these patients without it. The majority of cases showed good results after three or four treatments and some of the most severe cases showed striking improvement. The effect is upon the sebaceous glands, which offer least resistance than other skin structures.

The usual quantity given is one-fourth skin unit every seven days for five or six exposures, then every fourteen days for five or six exposures. Under or over exposure brings undesirable results. The eyes and hair must be screened with lead foil when giving treatments of the face.

The Treatment of Carcinoma of the Prostate. John H. Cunningham, M. D., Boston. Bost. M. & S. J., January 26, 1922, page 99.

THIS paper touches upon the clinical course of carcinoma of the prostate and upon diagnosis and then passes to the treatment.

"Too much emphasis cannot be placed upon the importance of the pathological examination of all prostates removed, because a recognition of the condition (of malignancy) calls for post-operative treatment with radium, if we are to do everything to prevent a local recurrence of the disease."

If a suspicion of carcinoma arises during pre-operative examination a complete x-ray examination of the entire skelton is advised as bone metastases are not uncommon. Metastases of the lungs will also be revealed by x-ray, though this may not be so in the abdominal nodes and organs.

The author is not optimistic of cure by any means in carcinoma of the prostate, but believes that life may be prolonged and relative comfort procured by the combination of radium and surgery, or by palliative measures with radium alone, or this combined with bladder drainage when surgery is out of the question. "It is today generally admitted that the radical operation as a curative means is futile, because, even with complete removal of the local disease, the metastasis remains."

As to radium the author is "convinced that it has much value, chiefly in preventing local recurrences if employed before and at the time of operation, and subsequently employed following the operative convalescence."

Two leading views were held at a recent meeting of the American Association of Genito-Urinary Surgeons. One view holds that surgical procedures dealing with the malignant gland tend to favor metastases by opening channels for dissemination. Its adherents advocate radium alone, and with suprapublic bladder drainage if necessary. The other view is that as much of the malignant gland as possible should be removed and radium implanted in the prostate area followed by local radium applications later. Favorable local results were reported by both schools.

The author separates his cases, broadly, into two groups. One group in which the patient has symptoms dependent upon prostatic obstruction and whose general systemic condition will permit surgical intervention—and the other group in which the same general symptoms are present, but for whom surgery is not possible,

In the first group as much of the gland as possible is removed, even including the seminal vesicles in some cases, and sometimes the prostatic sheath. From five hundred to one thousand millicurie hours of radium, according to the amount of the growth left at the time of operation, are left in the prostatic area, and about three weeks following operation, daily radium treatments of one hundred millicurie hours are given through the rectum, bladder, and urethra for thirty days.

The second group are subjected in some instances to the "Punch" operation with subsequent radium treatment, or, suprapubic drainage is followed with radium needles, which are introduced through the suprapubic opening and left implanted for from five hundred to one thousand millicurie hours, with subsequent treatment of the gland by radium therapy through the rectum, urethra and bladder.

Still another group includes those with few distressing symptoms of prostatic obstruction and those with local recurrence of the disease following operation. This group is given radium treatment alone or combined with catheterization and irrigation to relieve a residual urine and bladder infection.

The radium treatment is a combination of the methods of Barringer and of Young—the Barringer method supplemented by that of Young about three weeks after the needling. The daily applications of radium for one hundred millicurie hours are introduced into the prostate region through the rectum, urethra and transvesically in the ratio of three rectal to two urethral to one bladder application, according to circumstances, and never applying radium to the same area on successive days. At the end of this course of treatment the gland and perhaps the seminal vesicles are again needled by the Barringer method. Examination is made again in about a month, catheterization and bladder lavage being carried on in the meantime. Relief of symptoms and diminution in the size of the gland is not to be looked for until several weeks after the course of radium treatment.

"The course of treatment as outlined is essentially that employed at the Mayo Clinic, where results are classified as:

1—Relieved of all symptoms.

2—Growth shrunken, but some urinary obstruction.

3—No change.

4—Remarkable results and apparent local cures.

The results in Young's clinic are classified as:

1—Actual beneficial results (diminution in size, softening of the carcinomatous gland with relief of retention in most instances.)

2—Symptomatically improved: diminution in frequency of urination in about sixty per cent, relief of local pain in seventy per cent, cessation of bleeding in all cases where a factor; five per cent of the patients of four years are without a return of local symptoms.

The author's cases, on the whole, he has found symptomatically and locally improved, with some apparent local cures. While not covering as large a number of cases as those clinics just referred to the results have followed along the same lines.

Carcinoma of the Prostate. B. S. Barringer, M. D., F. A. C. S., Dept. Urology, Memorial Hospital, New York City. Jour. S. G. & O., February, 1922, page 118.

THIS paper deals with the diagnosis and treatment of carcinoma of the prostate and a report to date is given of the cases of carcinoma of the prostate treated by radium at the Memorial Hospital.

The gross pathology, types of malignancy, frequency of growth beyond the prostate, prostatic carcinoma secondary to bladder carcinoma, early symptoms, routine and pathological examination are discussed. The technique of radium apparatus which has been in use in this hospital since October, 1915, is described as follows:

Prostate Needle: A steel needle, ten to fifteen centimeters long, number eighteen gague, is used and upon the end of it fifty to one hundred millicuries of radium are placed in the end terminal (three centimeters). Under novocaine, guiding by a finger in the rectum, this is inserted through the perineum into one of the prostate lobes; for the other lobe the needle is only partially withdrawn from its position in the perineum and then inserted into the other lobe. A carcinomatous mass two centimeters in diameter will stand three hundred to four hundred millicurie hours. In two to three months a smaller dose may be given. In some cases twenty-five to fifty millicurie hours every week have been given.

Seminal Vesicles: These are radiaed routinely if the size of the prostate does not prevent their being reached. They are sometimes reached through the rectum (after first cleansing this with soap and water) by inserting a small cannula up to the vesicles and inserting a needle through the cannula, thus reaching the vesicle.

Bare tubes in the prostate and seminal vesicles have been used, both in the prostate and in extensions beyond the prostate, but are not so efficacious as the needles, and besides are more painful.

Urethral: The use of radium in the prostate urethra has been limited to cases in which the carcinoma has directly invaded the urethra. Tubes of screened radium (rubber one mm. silver 0.6 mm.) two centimeters long are attached to a linen thread and inserted into the bladder through the sheath of a urethroscope, which is then removed and the tubes pulled out into the prostatic urethra by the attached thread. When the treatment is finished the tubes are pulled out of the urethra. Two hundred millicurie hours is the maximum dose. This may be varied by using a silver tube of radium in the end of the urethral catheter.

Rectal: Screened radium in the rectum is used in only a few cases, as it is more painful and not so efficacious.

Residual Urine: In most cases increase of this can be prevented and in a few cases a decrease can be brought about by the needle method. If this produces no effect and the symptoms warrant it, one of the following methods is employed: (a) a bare tube of radium (six millicuries) is placed in the end of a flexible needle and this, by the aid of the McCarthy urethroscope or the Buerger operative cytoscope is plunged into the prostate at the lower part of the bladder neck, the bare tube is punched out of the needle by a plunger into the prostate and left there. (b) If the residual urine does not reduce after this method the Young punch operation or suprapubic drainage with suprapubic partial prostatectomy is resorted to. The ideal procedure in intracible cases has not yet been found.

Pain caused by the growth of the carcinoma around the pelvic or spinal nerve has rarely reacted to radium or x-ray.

Swelling of the legs, caused by pressure of the carcinoma on the common iliac vein has been successfully combated by the radium pack placed over the abdomen and centered on the vein (ten thousand to fifteen thousand millicurie hours).

Rectal Stricture: In one case two bare tubes of five millicuries, were inserted into one segment of the stricture, being inserted through the rectum. They relieved constipation and in one case a colostomy was thereby avoided.

The writer submits a number of case reports and draws these conclusions:

1—In but two per cent of the cases of carcinoma of the prostate seen at the Memorial Hospital is the carcinoma apparently confined to the prostate.

2—Routine prostate examination of all patients, beyond the age of fifty

and irrespective of symptoms, is the only rational method whereby an early diagnosis of carcinoma of the prostate can be obtained.

3—The results of radium treatment of carcinoma of the prostate are superior to operative removal, both in causing regression and in coping with urinary retention.

Our Problems. O. H. McCandless. M. D., Chairman's Address, Section on Radiology, Southern Medical Association, Annual Meeting, Hot Springs, Ark., November, 1921. Southern M. J., January, 1922, page 17.

THE intelligent use of the x-ray necessitates co-ordination of other diagnostic and therapeutic effects.

"There is unquestionably a toll of disability and mortality from attempts to correct morphological changes and exaggerated functions that are largely compensatory. * * * A wide range of familiarity with compensatory phenomena necessitates an intensive study of the whole field of medicine. Bone changes and other anomalies cannot always be correctly diagnosed without a knowledge of the common endocrinopathies. The significance of calcium and its distribution, the distribution of gas in muscle tissue, emphysematous and pneumo-visceral phenomena, whether bacterial, traumatic or spontaneous, and the significance of exudates and transudates have a bearing upon prognosis and diagnosis, or both.

The time element, if nothing else, prevents the surgeon being equally proficient with the x-ray, and the knife, else he might be his own roentgenologist; on the other hand, the roentgenologist who thinks that x-ray alone will enable him to render reliable diagnosis will soon defeat himself. Both the training and experience of the roentgenologist "should be such that he may stand graciously firm in his report when it is warranted, yet be humbly conservative in the great number of conditions in which the x-ray has shown a percentage of error."

The really great problem of the roentgenologist is how to promote co-operative efficiency.

The technician is a problem or not, accordingly as he (or she) works under a competent medical man or puts forth his efforts in another field, unfortunately legitimate in many of our states, where any cult or "ism" may diagnose and give medical advice under the guise of a commercial x-ray laboratory.

An independent state radiological association has served a good purpose in many localities.

The constant influx of new apparatus presents an increasing debt to the physicist and demands increasing skill on the part of the man using it—and even the competent man can and does sometimes make mistakes. New problems in therapy arise with the advent of the new apparatus.

Post-roentgen nausea is as yet an unsolved problem. The spinal cord and supra-renal bodies are thought by some to play some part in this. Dr. Orndorf believes that removal of all body covering from the patient lessens the nausea.

Post-mortem study greatly aids in the acquirement of knowledge by the roentgenologist and should not be overlooked by him.

An elaborate discussion of the above mentioned problems might be made, but time did not permit of that in this paper.

The Roentgenologic Diagnosis of Gastric Ulcer. Russell D. Carman, M. D. Southern M. J., January, 1922, page 20.

THE roentgen ray is not a competitor of the microscope in diagnosis, as it only discloses the presence of a tumor, ulcer, or lesion of uncertain character.

Nearly all neoplasms of the stomach are cancerous. There are three gross types of gastric cancer, namely, the medullary, the scirrhous and the mucoid or colloid. The first is characterized by large, soft, lobulated or cauliflower-like masses projecting into the lumen. Scirrhus cancer infiltrates the stomach wall with a hard dense tissue, but the neoplasm does not project markedly into the gastric cavity, but gives rise to contraction. Mucoid or colloid cancer is related to the scirrhous type, but masses of gelatinous tissue are found instead of the dense scirrhous type.

Ulceration may considerably alter the fundamental characteristics of gastric cancer (hyperplasia and tumefaction). Some of the malignant ulcers cannot be roentgenologically distinguished from benign ulcers.

The Carman technique is as follows:

Sixty grams of thoroughly cooked cereal mixed with sixty grams of barium sulphate (with sugar and milk if the patient cares for it, but no cream) are given instead of breakfast. Nothing else except water is permitted until after the examination has been made.

Six hours after this the patient is fluoroscoped while standing and with most or all clothing removed and the advancement of the six hour meal is noted. The patient is now given one hundred and twenty grams of barium sulphate, fourteen grams of sodium bicarbonate and ten cc. of syrup of raspberry in two hundred and fifty cc. of water, all very thoroughly mixed. The cardiac portion of the stomach is observed while the patient is drinking and then the stomach as it fills. After the patient has finished drinking the peristalsis is watched.

By manual pressure the contents are forced upwards so that the cardiac end is well outlined—the duodenal bulb is also demonstrated in like manner. The general form, outline, tone, position, mobility and flexibility of the stomach are all observed and the patient turned at various angles. He is also examined supine and prone on the trochoscope if a lesion in the cardia is suspected. Two or more plates are then made with the patient prone and the tube at the back. It is important that the examiner be in the darkened screen room fifteen to twenty minutes before the examination.

The roentgenologic signs of cancer are:

Altered Motility—

1—In nonobstructive cases—
- (a) Exaggerated initial clearance, the gaping pylorus.
- (b) Hypermotility of the six hour meal.

2—In obstructive cases—
- (a) Scanty or absent initial clearance.
- (b) Six hour retention.

Altered Peristalsis—

1—Absence of peristalsis from involved area.

2—Weak peristalsis (in nonobstructive cases.

3—Exaggerated, irregular peristalsis and antiperistalsis (in obstructive cases).

Lessened flexibility in involved portion of the gastric wall.

Lessened mobility with extension of growth to tissues outside the stomach.

Alteration of size (capacity) of stomach—

1—Shrinking (non-obstructive, scirrhous).

2—Dilation (of uninvolved portion of stomach above obstruction).

Persistent local spasm. Incisura opposite lesion (occasional).

Displacement of stomach. Upward and to left by scirrhous cancer.

Meniscus, sign of some ulcerating cancers.

Large niche ulcer (occasionally).

"Consonant with its gross pathology the tumor-producing cancer of the stomach has for its chief and indispensable roentgenologic sign the filling defect." There are various simulants of filling defects. It must remain constant in form and situation despite manipulation and antispasmodics.

Gas or fecal matter in the colon, secretion in the stomach, spasm, spinal pressure, extensive tumors, ascites, ovarian cysts and pregnancy may produce apparent filling defects.

Hypermotility is a common characteristic of cancer unless obstruction exists, in which case emptying is retarded. In non-obstructive cases peristalsis is generally diminished and may be totally lacking if involvement is extensive, and is usually absent in the invaded area. Exaggerated peristalsis in the region above the growth is often present in obstruction cases.

Unless the growth has extended to adjacent tissues mobility of the stomach is not impaired. Diminution of flexibility of the gastric wall in the area invaded by the growth is often discovered, scirrhous cancer especially stiffens the wall.

"Like every other diagnostic test, the roentgen ray is not infallible. Sometimes it overlooks; sometimes it misinterprets. Notwithstanding these difficulties and occasional lapses, the roentgen ray will usually discover cancer as early as the patient's symptoms drive him to seek medical advice.

"I would particularly stress the fact that the roentgen ray will show a cancer earlier than the most thorough clinical examination. This is not said in disparagement of clinicians. * * * The service of the x-ray is increasingly invoked and improves constantly in efficiency."

X-Ray Work in Country Practice. Charles D. Enfield, M. D., Louisville, Ky. J. Iowa S. M. S., February, 1922, page 44.

THE general practitioner in the small community is handicapped in many respects through lack of expert roentgen consultation and advice. In these communities, remote from the advantages of well organized clinics, the need for roentgen diagnosis is just as great, except in numbers, as in the larger communities.

It is impracticable and undesirable that the general practitioner should attempt to acquire the highly specialized skill of the expert roentgenologist, but the writer believes that a certain amount of training will yield valuable returns to both the community and the practitioner himself, for in at least twenty per cent of the cases coming to him for diagnosis, exclusive of fractures, the aid of the roentgen ray is needed.

The war brought about great advances in the design and manufacture of x-ray equipment, so that now a simple plant may produce high grade roentgenograms. This is the simplest and easiest part of the problem and can be soon mastered by any medical man. The interpretation of films and of the images on the fluoroscopic screen is a different problem and the ability to successfully do this can not be "picked up", nor can it be learned from books alone. The writer advises that several weeks be spent in some clinic where there is an abundance of material and an expert roentgenologist in charge who will aid in the study of interpretation. Such a method will give a perspective for later independent work and frequent return visits will give the general practitioner a wholesome respect for his own limitations. Without adopting this method any attempt by him to make use of the x-ray will only be detrimental to the patient, himself, and the whole field of roentgenology.

The field of roentgen therapy must, except for the most superficial treatments, be left to the experienced roentgenologist. The possibilities of danger are too many and too great for a novice to enter it.

Concerning Radiation in Pelvic Cancer. Albert Soiland, M. D., Los Angeles, Cal. Southwestern Med. February, 1922. page 47.

THE writer believes that favorable operative risks should receive the benefit of the best surgical skill, but when this is not feasible there is no excuse for withholding radiation.

There is no cure by *any* means for unmistakable cancer of the uterus, but distinct benefit may be derived from radiation. Carcinoma of the cervix may be cured in a certain proportion of cases. Border line cases should be radiated and treated just as carcinoma.

The writer's technique for cervical carcinoma "consists of an implantation in the cervix of fifty milligrams of radium element, with filter of one-half millimeter of brass and one millimeter of hard rubber, for fifteen hours, giving four such applications within six days time. * * * This treatment is followed by x-radiation over the lower abdomen through four ports of entry."

In cancer of the body of the uterus the technique is practically the same, except that radium is carried up to the fundus if possible. If this can not be accomplished, radium is packed in an additional two millimeters of hard rubber filter, the rectal wall is protected with two millimeters of lead and the entire mass inserted into the posterior cul de sac, additional tubes are placed in each fornix, and the exposure carried up to six thousand milligram hours in six days time. The x-ray cross fire is directed through six ports of entry on the abdomen, giving a total of nine hundred milliampere minutes with ten millimeters aluminum filter, one-half inch cotton filter, under compression, one hundred kilovolts, five milliampere tube circuit at an eight inch skin distance."

Routine procedure of intra-uterine pre-operative radium application, operation following in five to seven days, immediately followed with radium in the vagina, x-ray over the abdomen in the usual post-operative way is advised by the writer.

Fractured Vertebrae. William B. Bowman, M. D., Los Angeles, Cal. Southwestern Med., January, 1922, page 13.

THIS paper is a plea for more careful and thorough examination for fractured vertebrae in back injuries. Before the day of the x-ray many compression fractures of the bodies and transverse processes of the vertebrae were doubtless often overlooked, for there is a class of fractured vertebrae which cannot be diagnosed by any other means.

In the writer's experience the following sites were more common in compression fractures, and they are given in the order of their frequency of occurrence: first lumbar, twelfth dorsal, second lumbar, eleventh dorsal, fifth lumbar, fifth and sixth cervical vertebrae. Some definite injury, e. g., striking the head while diving, was known to have occurred. He thinks syphilis may be a predisposing factor in these fractures.

Roentgenograms of the vertebrae should be taken in both the anteroposterior and lateral positions. Two roentgenograms at right angles to each other give more information than stereoscopic roentgenograms.

These fractures must be differentiated from tuberculosis, carcinoma, syphilis, infectious diseases of the spine and from congenital anomalies. The history is important here. In tuberculosis the bone destruction is not accomplished by proliferation or callus formation and fever is present. In carcinoma also there is bone destruction without proliferation, the pain is severe usually and there is a primary lesion elsewhere. In syphilitic spondylitis with caries the pain is worse at night, new bone formation is more marked than in fracture, and the periosteum is greatly thickened. In spondylitis deformans the bodies are asymmetrical and the lesion seldom confined to one vertebra. In the corners of the bodies are chronic hypertrophied changes with subsequent fusion. Failure of fusion of the laminae of the transverse processes, an extra or a lack in ossific center (particularly in the dorsal re-

gion) are congenital anomalies often mistaken for fracture.

In all severe injuries the writer would take at least one large roentgenogram of the spine and if a lesion were found would then take a roentgenogram of the affected area in every conceivable position. Duplitized films with double intensifying screens will shorten the time of exposure, give greater detail in heavy parts and with the Potter-Bucky diaphragm will give clear detail in regions heretofore unattainable.

X-Ray Treatment of Tonsils with the Conjoint Use of the Ultra Violet Ray. A. J. Pacini, Director Burdick Research Laboratory, Washington, D. C. Jour. Radiol., April, 1922.

SURGICAL indications exist and should be utilized, but there is a class of tonsillar distrophies where x-rays are eminently useful, and this is particularly true in hypertrophied tonsils in children, which is the phase of the pathology treated in this paper.

The author states that it is probable that the tonsils during childhood contribute to the establishment of an immunity and this must be taken into consideration in determining the line of treatment followed.

Speaking *only* of hypertrophied tonsils in children, there are three types of conditions found: (1) not excessively reddened tonsil, (2) obviously reddened tonsil but infection not clinically established, (3) markedly reddened and congested and infection clinically established.

In the first type hypo-activity will be discovered from careful observation and the treatment should establish some degree of activity, therefore surgery is not warranted and roentgenotherapy should bring the results desired, and it has brought brilliant results.

In the second type the tonsils appear to be playing a markedly active part and x-ray should first be resorted to before surgery is decided upon. The lack of success in roentgenotherapy of the second type is due to the fact, the writer believes, that it fails to correct immediately the acute infective exacerbation. The use of the ultra violet ray is advised here, for by this means the acute infection is quickly terminated and the clinical symptoms relieved.

In the third type purulent accumulations are the differentiating symptom, and by this is meant definite gatherings of pus in the crypts and spaces on the surface and in the mass of the glands. Here the x-ray and the ultra-violet ray are useless and surgery is indicated. The major immunizing influence of the gland has been lost through the effects of pathogenic inflammation and it is no longer a useful organ.

Immunologic activity is characterized by the thriving of many organisms below the threshhold of clinical infection; infection is characterized by the presence of one dominant strain of organism that has established an activity that no longer contributes to the physiologic manifestations.

The Mechanics of the Digestive Tract. Walter C. Alvarez, M. D., Assistant Professor of Research Medicine, George Williams Hooper Foundation for Medical Research, University of California Medical School. Octavo, Extra Cloth, 192 pages, twenty-two illustrations. 1922. Published by Paul Hoeber, 67-69 East 59th St., New York City. Price, $3.50 net.

REGIONAL differences of behavior in the various parts of the entire digestive tract have been studied from the view point of the physiologist and the observations and conclusions drawn supply the subject matter of this book. An enormous amount of experimental work forms the basis for the theories advanced. It is a research work full of practical suggestions, however, for the practitioner.

With this preliminary description the chapter headings are sufficiently suggestive of the contents and are as follows: (1) The Autonomy of the Digestive Tract. (2) The Myogenic Nature of the Rhythmic Contractions and the Functions of Auerbach's Plexus. (3) The Smooth Muscle of the Gastro-Intestinal Tract. (4) The Different Types of Peristaltic Activity. (5) Gradients. (6) The Underlying Basis of the Rhythmic Gradient. (7) Other Related Gradients. (8) Graded Differences in the Stomach Wall. (9) Practical Applications of the Gradient Idea. (10) Reverse Peristalsis. (11) Objections and Difficulties. (12) Technical Methods and Apparatus.

The bibliography covers more than four hundred and fifty references to the literature and includes the names of several hundred authors from Hippocrates to the Mayos. This in itself is an index of the real labor which went toward the consummation of this noteworthy work. The index, covering eight pages, is divided into two sections, authors and subjects being separately listed.

Radiotherapy of Diseased Tonsils. Robert H. Lafferty, M. D., and C. C. Phillips, M. D., Charlotte, N. C., Jour. Radiol., April, 1922.

IT is about a year since radiologists in general began using this treatment.

As to the results noted in a survey of the field the writers state that while it is too soon to draw definite conclusions, there are some cases observed over a period of six years since the first treatment with no return of trouble. In no case has surgery been resorted to.

The first fifty cases treated by the authors fall roughly into four classes: (1) adults with large soft hyperplastic tonsils with deep crypts containing pus, (2) children with large infected tonsils and crypts, (3) adults previously operated but having part of the tonsil and scar tissue present, (4) adults and children who have had the entire tonsil removed and who have infected and enlarged lymph follicles in the pharynx.

The first class (twenty-nine cases) received an average of five treatments, no second series was necessary. The second class (eleven cases) received an average number of six and two-tenths treatments with perfect results in all but one case, who did not complete the treatment. The third class (four cases) improved with an average of eight treatments. The fourth class (six cases), showing generally an involvement of the entire Waldeyer's ring and a return of adenoids, gave apparently good results, but final judgment is reserved upon these, as is also a formulation of conclusions in general, until more time has elapsed.

The technique used in most cases was that recommended by Witherbee.

Organ Stimulation by the Roentgen Ray. William F. Petersen, M. D., and Clarence C. Saelhof, M. D., University of Illinois College of Medicine, Chicago, Ill. Jour. Radiol., April, 1922.

IT is probable that stressing the destructive effects of irradiation has contributed to the neglect in developing a field of roentgen therapy in the direction of selective functional tissue and organ stimulation.

The diametrically opposite effects of irradiation, stimulative and lethal, are well known. Functional stimulation of the organs of internal secretion was readily observed by the authors following moderate doses of rays and the data of such animal experimentation is given in the original article.

There are two methods of approach in the clinical application of functional organ or tissue stimulation, namely, the direct, in which stimulation of a hypo or disfunctioning organ is sought, and the indirect, which takes into consideration the fact that the roentgen shock is akin to a protein shock and has therefore, an *a priori* basis for therapeutic effects.

The Germans have collected a series of observations along the line of the first method. Stephan concluded from his experiments that methods which stimulate the natural forces to greater resistance to the invasion of tumor cells would be of more value than present methods. One of the most interesting of these researches was one concerning the pancreas by Stephan. Increased sugar mobilization, the author notes, has generally been found as a result of irradiation of the abdominal viscera.

Following this line of research by Stephan experiments were carried out by the authors upon depancreatized dogs and the general conclusion drawn is that with moderate doses of roentgen rays applied over areas containing pancreatic rests there may result an augumentation of sugar excretion, followed by evidence of pancreatic stimulation with increased sugar tolerance lasting from three days to three weeks. Lastly, if the dose is too large or if a cumulative effect is produced there results a lowering of the sugar tolerance.

Conditions for this type of experiment are much more favorable in the dog than in the human diabetic subject —but even in clinical cases there is some evidence that a diabetic process may be influenced by direct radiation though treatment is not advised at present unless all other means are of no avail in diabetic coma.

The differences that may be determined in the serum when different organ groups are rayed for different time periods were also a subject of investigation. The hepatic, the splenic and the lower abdominal regions were selected for this. The leukocytosis following such regional irradiation varied, giving a sharp but transient rise in the hepatic area, a step-like rise in the intestinal area; in the splenic area a diminution of the white count was manifest. Coagulation changes followed after irradiation of all the areas exposed. Enzyme alterations were most marked after radiation of the hepatic and intestinal areas.

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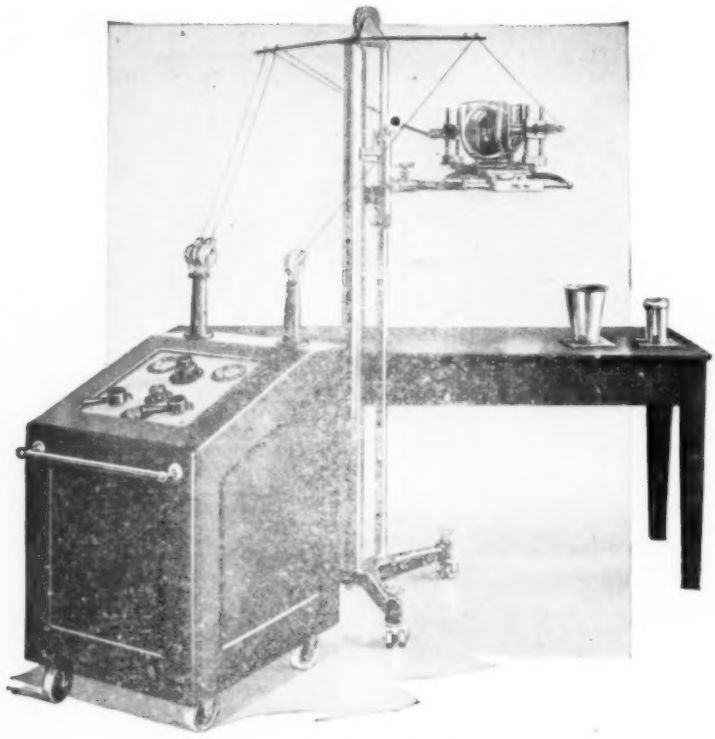

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